

North Carolina Highway Bulletin

VOL. IV

AUGUST, 1923

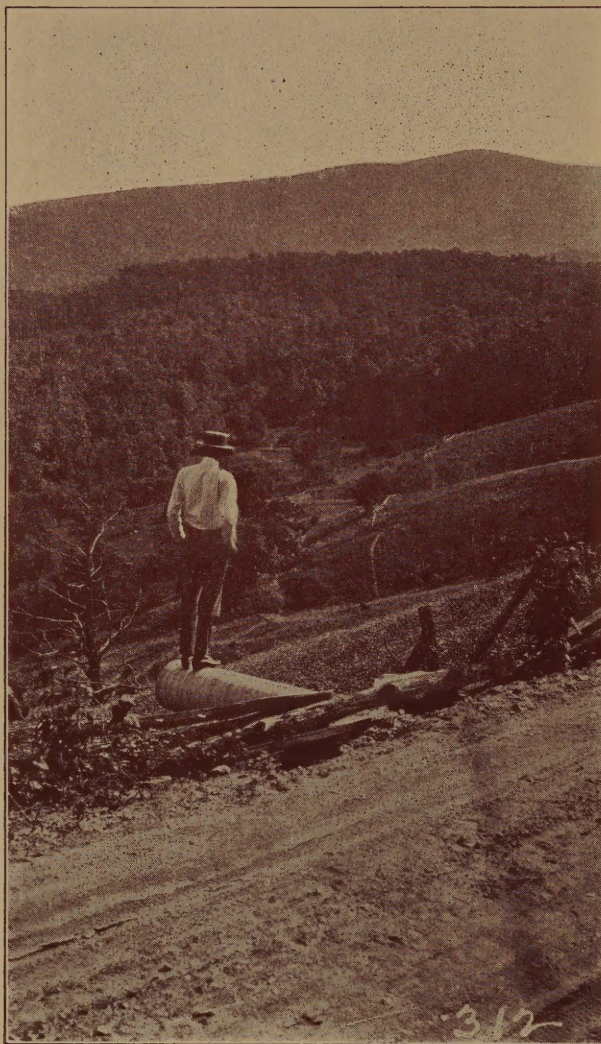
NO. 6



REFRESHING SCENE ON YONAHLOSSEE ROAD—NEAR BLOWING ROCK

Report of Inspection of

A PERMANENT CULVERT



An Armco Culvert in "The Land of the Sky."

Recently installed on the State Road over Grandfather Mountain, Second highest peak east of the Rockies. Located between Blowing Rock and Linville, North Carolina.

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NORTH CAROLINA HIGHWAY BULLETIN



VOL. IV, NO. 6

H. K. WITHERSPOON, Editor

August, 1923

Chimney Rock Highway Reconstructed

By C. F. NILES, *Resident Engineer*

IN ORDER to appreciate the work involved in the construction of a hard surfaced road over this link in the Charlotte-Asheville Highway, one should be familiar with the locality. This road begins in "The Chimney Rock Country" at the Rutherford-Henderson County Line and goes into the "Hickory Nut Gap Country," to the Henderson-Buncombe County Line. It is essentially a tourist section as the land is so mountainous and rocky that farming is not an industry but a necessary evil to the people. The mountaineers of this region raise a little wheat, rye, corn, and enough cattle and hogs for their own subsistence only. Some of the corn is used for bread but it is said there are other ways of consuming corn in these mountains. During the summer months tourists visit this section of Western North Carolina in large numbers and leave enough wealth to make it possible for the local people to exist the rest of the year. Nearly every cabin is a boarding house of more or less pretension. The country offers various amusements to tourists, such as: fishing for rainbow trout, swimming in cold mountain streams, mountain climbing, camping, killing rattlesnakes, etc., and a great many people come here from the states south of us.

As to the road project itself it has a rather interesting history. The people here tell that twice before has it been built by the State. In 1916, a great portion of it was washed away by a terrible flood. In 1917 it was rebuilt by convict labor as Federal Aid Project No. 2, with Mr. Wythe M. Peyton (lately District Engineer in the Ninth District) as Resident Engineer. At that time about sixty convicts were worked for two years or thereabouts constructing the road and wooden bridges. There was little money to spend so the alignment followed the Hickory Nut Creek rather religiously to save grading cost. That road is now very badly worn out and is being rebuilt as a waterbound macadam road with reinforced concrete bridges. The roadway will be twenty-six feet wide with eighteen feet of pavement. There will be four bridges two of which will be single spans of thirty and forty feet respectively. One of the others will be four spans of forty feet each while the fourth will be

two arch spans of about one hundred feet each. The latter bridge has not yet been designed or let. These bridges will carry a roadway twenty feet wide paved the entire width.

Mr. J. B. Ross, Jr., of Pickens, S. C., has the contract for the roadway grading, pipe culverts, and paving. His contract was signed June 2, 1923, and work commenced immediately.

Mr. R. C. Stevens of Asheville, N. C. has the contract for the bridges and box culverts. His contract was signed June 7, 1923, and on July first one culvert had been completed.

The work is of very heavy mountainous type. There are sheer cliffs twenty-five to seventy-five feet high with which to deal. Whenever possible they are being avoided but some of them will have to be blasted away. In places the location is perilously hung between precipices and Hickory Nut Creek which is from fifty to one hundred feet lower than the road. These features offer continuous problems and makes the work very interesting from an engineering standpoint.

The new road will not follow the old alignment entirely. It shortens the distance between Chimney Rock and Hickory Nut Gap considerably and straightens the worst of the curves. Even then there will be two places where the road winds back upon itself as it climbs so that the road will be visible three times down the mountain from the upper level.

The estimated cost of the roadway and bridges is \$255,602.50. It is a safe wager that this estimate will be exceeded, however.

Some benefits to accrue after this project is completed are: quicker motor communication between Asheville and Charlotte, easier transportation for crops and therefore, more crops, more tourists to fleece, more children to be able to go to school and to better schools, more pleasures for the mountain people now shut in away from the towns, more inter-communication between the people of Western North Carolina and the Piedmont and Coastal portions. The added business brought this section of America's Playground will pay the cost of the road building in a few years.

Central Highway in Davidson County Under Construction

PROJECT 525 is that portion of the central Highway which extends from the Yadkin River to the city of Lexington, a distance of 10.24 miles. Bids for this project were opened on November 18, 1921; the contract for the roadway was awarded to Elliot & Sons for Standard Topeka Type pavement on December 16, 1921, and the contract for structures to Austin Bridge Company on December 6, 1921.

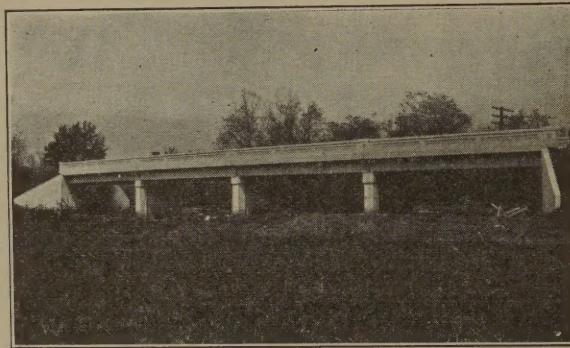
Grading was started by the former on December 23, 1921, and the pouring of concrete base on May 12, 1922. A stone quarry was opened at the southern end of the project on the bank of the Yadkin River, thus enabling crushed stone to be loaded directly into cars on a siding of the Southern Railroad and transported to a siding near Lexington for the pouring of base on the half of the project adjacent to Lexington. The other half was poured by direct haul with the trucks from the quarry to the concrete mixer. Approximately 80% of the base was poured with stone from this quarry and the remaining 20% was purchased from commercial quarries. Local sand was used, such pits furnishing about 75% of the amount required, and the remaining 25% was purchased from commercial pits.

Equipment for pouring of base consisted of Hetzel Forms, Multi-Foote Mixer (21 EM Type), Buffalo Pitts Steam Roller, and various types of trucks which hauled concrete materials from central proportioning plant direct to the mixer, each truck hauling one or more 4-bag batches for a 1: 2½: 5 mix. Pouring of base was completed on May 17, 1923. The material composing the subgrade on this project is generally a red clay, consequently gets too muddy for pouring with a slight rain fall and dries out slowly, thus necessitating more than the average amount of lost time.

The Topeka surfacing was sublet to the Harlee-Thrasher Construction Company and work was begun on November 16, 1922 and carried on expeditiously and satisfactorily until its completion on May 26, 1923. By the use of two rollers the laying of asphalt surfacing was permitted during the winter months. A new 1,200 yard capacity Cummer plant had previously been set up by the road contractor

at a point about one mile from the city of Lexington, and the surface course was laid from this plant.

The contractor is at present employed in building shoulders, digging drainage ditches, and doing other miscellaneous work in order to complete his contract which should require about two months from the present date.



BRIDGE OVER SWEARING CREEK—PROJECT 525

The work on structures on this project was started on January 3, 1922, and was completed on May 1, 1923. The contract consisted of three "Reinforced Concrete Deck Girder" type bridges at approximate stations 160, 274, and 407, these structures replacing I Beam Spans, a total of 13 spans both 35 and 40 feet for a distance of 522 feet.

On the first structure unusual circumstances were experienced with the foundations as all piers and one abutment are supported by a pile foundation while the other abutment is supported by both pile and rock. The main wall of this abutment rests on rock at about 3 feet below elevation shown on the plans. Drilling showed the rock to drop almost vertically downward at approximately the break in the wings with the main

wall. Piles were then driven to a penetration of 13' 0" apparently resting on rock. The same strata again appears in the bed of the stream, when 10' away piles were driven to a depth of 20'. Foundations gave comparatively little trouble; considerable running sand was encountered on a number of piers but the contractor handled this to the entire satisfaction of the Engineer in charge.

One feature of the entire project was the consistency, mixing, and placing of the concrete. The quality of the concrete placed by the contractor was all that could be desired.

The black top surfacing of the roadway was continued across the bridges giving them a smooth even riding surface.



SCENE ON PROJECT 528

The strike of the shopmen on the railroads throughout the country occasioned about two months delay to the contractor on both roadway and structures on this project due to the shortage of material aside from this loss of time another factor was loss of organization.

(Continued on page 15)

Road Work in Hoke County

By L. D. HICKS, *Resident Engineer*

HOKE County is situated in the southern part of North Carolina, a short distance west of Fayetteville, one of the oldest cities in the State. It is bounded on the north by Moore and Harnett counties, on the east by Cumberland county, on the south by Robeson county and on the west by Scotland county.

Hoke county is divided into two distinct physiographic divisions, known as the Sand-hills and the Flatwoods. The Sand-hills, the northern section of the county, is a rolling country of sand, long-leaf pine and "black-jack" oaks. The Flatwoods, the southern section of the county, is a low, slightly rolling, swampy region. In this section lie Projects 544, 545, and 546.

Project 544 consists of 10.3 miles of sand-clay road running almost due south from Raeford to the Robeson county line, and there joining Project 391. This Project, No. 544, is on route No. 70, which runs from the Virginia State Line to Lumberton. The road runs through some very low, flat, swampy country, necessitating much borrow.

Project 545 consists of 9.1 miles of sand-clay road running almost due west from Raeford to the Scotland county line, and there joins the Sixth District. This road is part of route No. 24 which crosses route No. 70 at the beginning of Project No. 544.

This Project is also in the Flatwoods, but runs through a more rolling territory.

Project No. 546 consists of a Sheet Asphalt pavement, 70 feet wide and about one-half of a mile long, running through Main Street in Raeford, the county seat of Hoke county. This project is really work of the state and city combined, the state paying for 18 feet of the pavement through the center of the street. This Project is also a part of route No. 70, and joins Project No. 544.

Situated as they are in the low, gently rolling section of the Flatwoods, these Projects could have very good alignment. On Project 544 there is one tangent four miles long, the remaining tangents ranging up to two miles in length. Project 545 too, has some very long tangents, the longest being about three miles long.

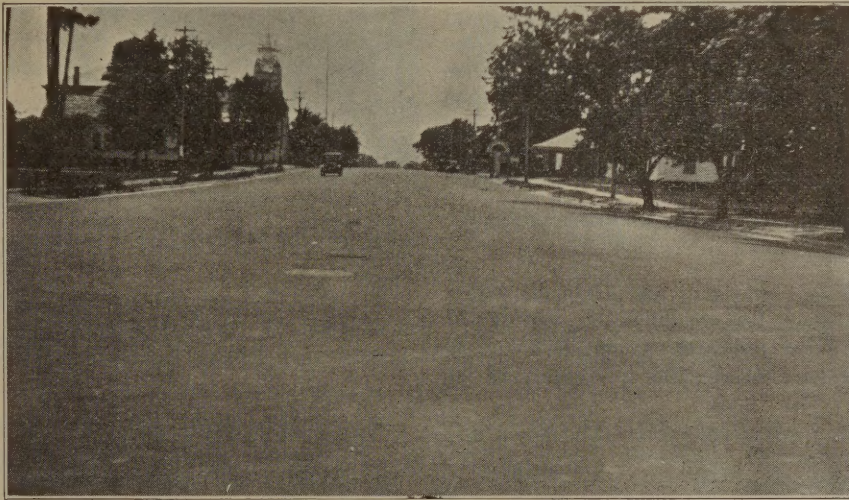
Whenever curves occur they are usually long easy ones, so slight in degree that banking is unnecessary. There are, however, two banked curves on Project 544, the longest being a 15 degree curve, but only

one occurs on Project 545. There are ten curves on Project 544, three occurring within a half of a mile of one another, and only six curves and one deflection occur on Project 545. Deviation from a straight line is only resorted to when a large swamp area is to be missed, or when it is desirable to cross a stream at right angles.

Since the alignment through this territory is good, it is evident that the grades too, are long and easy. On Project 544 there is one level grade one half a mile long, running through a long bay which is covered with water during the wet seasons of the year. The road through this place is built on an average of a one and one-half foot fill. The longest grade on Project No. 545 is a 0.3% grade for a distance of 3,000 feet. This too, is on a fill.

Drainage in this swampy country is one of the most important factors in the construction of a good

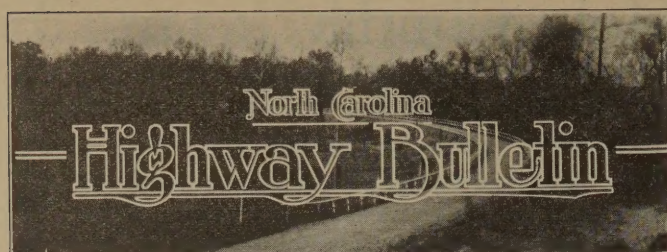
road. Larger openings for drainage structures are required than what the average engineer would estimate on first sight, and the opening necessary will deceive him sometimes even after he has figured the area to be drained. In several instances on both of the sand-clay Projects it was necessary for the resident engineer to



SHEET ASPHALT IN TOWN OF RAEFORD—PROJECT 546

change the sizes of pipe, and in one instance on each of the projects, it was necessary to put in a box culvert instead of a pipe. During the dry summer months the streams in many instances dry completely up, while in the extreme wet season of winter and spring, they turn into small creeks, draining some large bay or bays sometimes miles away.

These bays, occurring as they do sometimes, away from the road will back water up on it and cause trouble. In a few instances long ditches are necessary to preserve the road from this danger. One instance of this in particular occurred last winter on Project 545 when one of these bays began to back up into the road, making it necessary to dig a ditch at once to save that portion of the road. The shortest possible ditch to drain this bay had to be 1,500 feet long. In a few instances where a pipe was installed beneath the road long outlet ditches ranging from a few yards to 900 feet, were necessary to drain the pipe.



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This BULLETIN will be sent gratis to any State or county official, contractor, newspaper, trade publication, library, or other person interested in the improvement of roads and in the work of the Commission. Advertising rates may be obtained on application.

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Editorial

Bids will be asked on thirteen projects on the 29th of the current month. A number of projects on the list were carried over from previous lettings.

Mr. Thos. H. McDonald, Chief of the Bureau of Public Roads was in the State last month and after an inspection trip expressed himself as being highly pleased with the progress made.

July was an unusually good month for grade crossing accidents, thirty-five deaths being mentioned in one issue of a State paper. There is a "Stop" law in this State but without the use of some common sense by auto drivers it will avail nothing.

The scene on the cover this month is another reason why North Carolinians should "see North Carolina first." The western section of the State is full of such scenes as this and beautiful mountain scenery. The Editor will be very glad to furnish routings and maps free of charge to those desiring to make a trip to the mountains.

Figures recently compiled show that on July 1, 1919 there were under construction and completed 20 projects totalling 132.25 miles of roadway and costing approximately \$1,152,268.86 while on July 1, 1923 there were 440 projects totalling 3,266.31 miles of road and costing in round figures \$58,601,000, 1,327 miles of the latter mileage being paved roads.

Tennessee Governor Inspects N. C. Roads

NORTH Carolina was honored last month by a visit from Governor Austin Peay, chief executive of our sister state, Tennessee, who spent several days on an inspection trip of North Carolina's highway system and the organization and methods of the State Highway Commission. Tennessee is endeavoring to put over a bond issue of \$75,000,000 for the purpose of building and maintaining an up-to-date system of roads but prior to the election of Governor Peay roadwork was hopelessly mixed with politics, a combination which never has and never will prove anything but a failure. The first act of the present executive was to begin to straighten out the muddle that had existed for so long. The State Highway Commission was abolished and in its place a State Highway Commissioner who knew roads but not politics.

The Governor and his party were met at Hot Springs, near the Tennessee line by a party headed by the State Highway Commissioner who acted as pilot on the trip throughout the State. The roads in the vicinity of Asheville were inspected by the party after which the trip was continued by way of Rutherfordton, Bessemer City and Gastonia to Charlotte where the party spent the night of July 8th. The following day a trip was made to Greensboro, via High Point, where a sidetrip was made to the famous Guilford Battle Ground. Thence the party drove to Durham and to Chapel Hill where the Governor was shown over the University campus, after which the party continued to Raleigh for the night.

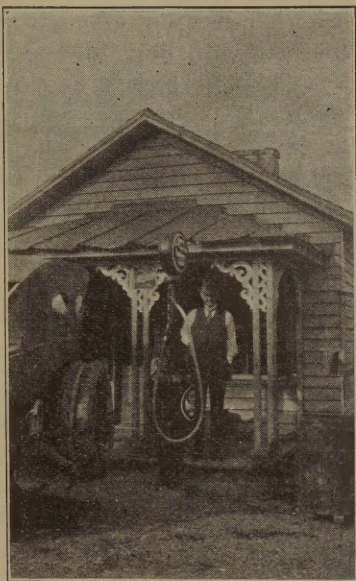
In spite of the beautiful scenery and the excellent roads which were enjoyed from the mountains to the capital, the chief interest of the Governor seemed to be in the State Highway Commission building where he was shown the various departments where different branches of highway work are carried on. The Governor took a deep interest in everything, which was evidenced by numbers of questions.

While in Raleigh the Governor and his party were

shown through the Hall of History, the State Capitol, and the State Prison and following a brief visit to Wake Forest left July 11th, on the return trip.

During his brief visit to the State, Governor Peay conferred with officials of the North and South Carolina Commissions with a view to connecting up the systems of the three states. The proposed road system of Ten-

nessee embraces approximately 4,100 miles upon which it is expected to spend the proposed bond issue of \$75,000,000. Tennessee has some good roads already but has not a unified system. The State is now working on a county aid system under which the State gets one-half of the automobile and gasoline tax while the remainder is divided among the ninety-five counties of the State. Federal Aid funds are matched one-sixth from State funds, one-third from county funds and the balance from Fed-



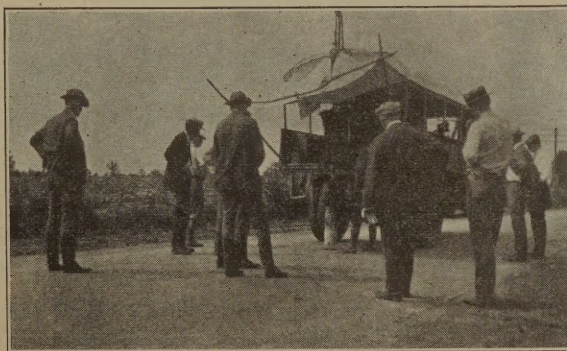
GOVERNOR PEAY BUYS GAS IN WAKE COUNTY



GOVERNOR AND MRS. PEAY ON STATE LINE

eral Aid.

The party consisted of Governor Austin Peay, Mrs. Peay, and Austin Peay, Jr., P. M. Estes, President of the Tennessee Good Roads Association and Mrs. Estes; Mr. Crossling, State Highway Commissioner; Neil Bass, Assistant State Highway Engineer; F. W. Webster, Division Engineer; R. L. Thornton, Federal Engineer; Cowan Rodgers, Vice-President Tennessee Good Roads Association; R. D. Hanlon, Secretary Knoxville Auto Club; Charles O. Hearon, editor Spartanburg Herald; A. B. Langley, (both members of the South Carolina Highway Commission), Myran T. Nailling, former Secretary Tennessee Good Roads Association; Thos. H. McDonald, Chief of the Bureaus of Public Roads; and S. F. Beatty, Vice-President



WATCHING OPERATIONS OF CORE DRILL

Austin-Western Road Machinery Co.

The first automobile was built and tested fifty years before the first railroad track was laid. Captain Nicholas J. Guinot, in 1769, is credited with having constructed the first motor-propelled road vehicle that actually ran. Steam was the power.

Project No. 272 Opens Trucking Section

By F. C. SMITH, *Resident Engineer*

PROJECT 272 begins at a point 9 miles from Clinton, on the old Wilmington and Raleigh road, now a section of State Highway route 60, and runs in a southeasterly direction, by way of Delway and Harrel's Store, to the Pender County line. A distance of 16.47 miles.

The contract for this project only calls for the grading, drainage and waterways, however, the contract for the hard surface, which is to be sand asphalt, was called for on February 1, 1923. A satisfactory bid was not received and it was not let, but is to be built by the Highway Commission at an early date.

The territory traversed by this road is one of the least developed sections of Sampson County. On a whole it is a very level strip of land, therefore, making drainage of chief consideration. At times it is very difficult to find fall enough to drain water from the culverts; in some cases it is necessary to go from 1,800 to 2,500 feet from the road, at which point we can only spill the water over the land. There are long sections which are so near level that it is necessary to dig the fall in the ground. In instances like this a ditch is dug on each side of the road, making center line of the ditch 25 feet from center line of the road. At the beginning of such ditches the depth is usually from one and one-half to two feet deep, with one foot bottom. As the distance and volume of water increases the bottom is widened, always cutting the side slope one-half to one. The amount of ditching that has been required on this project was foreseen, however, and was provided for in the preliminary estimate, as ditching enough was allowed to construct a ditch 3 feet deep the entire length of the project.

At station 990, what is locally termed "Harvel's Bay" was encountered. This land was no lower than the average along this section, but was so fertile that the gallberry, huckleberry, myrtle and fetter bushes had grown in such masses that it was found necessary to take these up by the roots for a distance of 1,600 feet. This small stretch required more labor per yardage than any similar section on this project. After taking up this mass of roots it was impossible for a team to walk on the mucky bottom, we then had to bring the wheelers to the edge of the fill, and keep a snatch team on the side to dump and pull the team out of the muck. There were times when the snatch team and

the wheeler team were all down, and it was necessary to bring the snatch team from the borrow pit to get them out.

The water ways on this project consist of 19 pipe lines, 41 culverts, ranging from 2x2 to 12x8, and one bridge, consisting of eight 40 foot spans of reinforced concrete with deck girder. This bridge spans six runs at the point known as "Taylor's Bridge." At first sight this bridge might appear to be an excess of what is actually needed. On investigation, however, the fall of the river was found to be such that it brings the water to this point very quickly after a rain fall, so much so that it has been known to overflow its banks to a depth of 4 feet. The grade of this road having been raised, it was deemed necessary to construct a bridge of these dimensions.

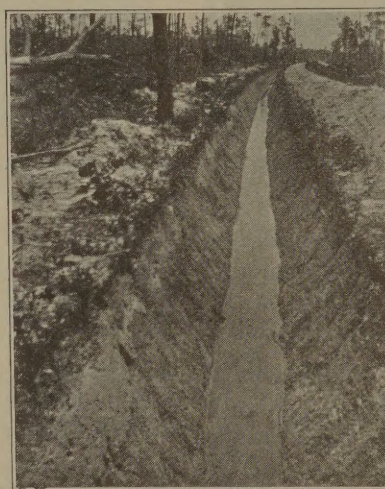
The greater part of the material for these structures had to be brought by rail, the nearest railroad station being Clinton, a distance of 12 miles from site of bridge. The sand, however, was obtained locally, and was pumped from the river bed by means of a locally constructed centrifugal pump, directly connected to an old Maxwell automobile engine.

The advantages of this road, when completed, will be readily seen when its location is taken into consideration. It connects with an improved top soil road to Clinton, which comes under project 275 to be hard surfaced, and also connects with an improved top soil road on the south, leading to Wilmington. The nearest railroad station to any point on this project is seven miles, while the best trucking markets

range from 11 to 15 miles.

This section of Sampson County is especially adapted to strawberries, and one of its natural resources is the huckleberry, better known as "Sampson Blues." They grow wild, and are very prolific in this section. The price ranges upward of \$10 per crate, and has not fallen below \$5 this year. Anyone having had any experience with berries knows the importance of having a good road to transport them over.

Traversing such a sparsely settled and undeveloped section of the county, Project No. 272 is expected to do more than any other one thing for the development and improvement of this section of Sampson County, and we hope ere long to have route 60 so that it will be the main thoroughfare to Wilmington.



TYPE OF DRAINAGE-DITCH ON
PROJECT 272

Hyde County Highway Opens Rich Country

THE development of Hyde County into one of the leading grain and cotton producing counties of Eastern North Carolina, has been for some time materially deferred through the lack of sufficient drainage and substantial highways. Now that Mattamuskeet Lake and other large districts are being drained it seems only natural that the State Highway Commission should have undertaken the construction of a through Highway which will extend for a distance of 19 miles, from the County Seat, Swanquarter, to the Beaufort County line at Leechville.

The section from Rose Bay to Swanquarter was let as Project 151 and construction begun in January, 1922. It was originally intended that this stretch of 4.3 miles should be elevated for about 5 feet above the average ground surface so as to take care of traffic even during the highest flood levels. Later it was found more advisable to materially lower the grade and at regular intervals, sumps, were introduced to provide an outlet over the road for flood water which would otherwise be impounded, causing inundation of the adjoining farms.

Parallel side ditches were excavated by dragline to provide borrow material for the roadway fill. This type of roadway is still open to improvement and research, however it has certainly proven its value as a drainage factor in swampy country, which is being proven by a noticed increase in the yields of farms adjoining the highway thus constructed.

The present constructed roadway offers an excellent travel medium for summer and dry weather traffic, but continued heavy rains in the winter season prove very detrimental to the fine sandy loam of which the road in main is constructed. With an idea of suppressing this condition, and of providing a roadway that could be traveled with comfort the "Year Round," the State Highway Commissioner has prepared this project for letting as a hard surfaced highway, which improvement will probably

be started upon the completion of the present grading contract, and pending favorable bids.

The structures on this project were let to Porter and Peck, Contractors of Greenville, N. C., and consisted of ten reinforced concrete box culverts placed at important drainage crossings. These structures have already been constructed and accepted.

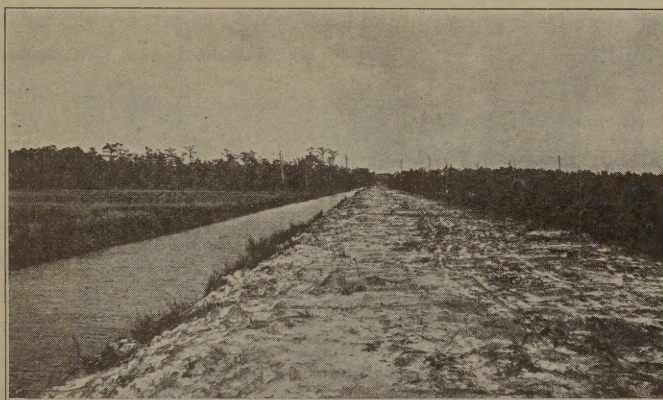


"BOULEVARD" SECTION ON PROJECT 151—ROADWAY NOT YET MACHINED

From Rose Bay village to Brick House Fork, the roadway is classified as Project 151 Extension. This Project as well as well as Project 151 was awarded to C. W. Lacy, Contractor, Wilmington, N. C., and extends for 3.62 miles from Rose Bay village toward Leechville, and connecting with Project 152.

Excavation is practically completed for one mile, beginning at Rose Bay Creek and extending toward Rose Bay village.

The structures on this project were awarded to O. A. Mann & Co., of LaGrange, Ga., and consist of nine reinforced concrete box culverts, and a seven span (treated) timber bridge, over Rose Bay Creek. A double 12x4 RC box culvert has been substituted for an originally planned 35 foot through girder concrete bridge



SCENE ON PROJECT SHOWING DRAINAGE CANAL—ROADWAY INCOMPLETE

over the Drainage District canal at Rose Bay village; the reason being the elimination of an extra high fill through the village. Many of the culverts were built on quicksand foundations. It has been found that after striking the sand strata excavation was almost impossible. This difficulty was overcome economically by letting the sand settle for several days without disturbance; the bottoms of the footing

forms then being floored with rough board.

It has been said that Hyde County is like a jug, this similarity being applicable to inter-county travel possibility, and all such traffic is carried over the one and only route by State Highway No. 91. An improved location of this road connecting Project 151

Construction of Monolithic Culverts

By I. H. BOGGS AND C. L. TINDALL, *Resident Engineers*

PORTIONS of Projects No. 200 and No. 201 in Carteret County cross tidewater swamps where bridges are unnecessary and where the flow can be accommodated by large culverts. The water in these swamps is salt; consequently, it was thought advisable to build monolithic culverts.

For a long time it has been an accepted fact that salt water is detrimental to concrete. No method of construction nor consistency of mix has yet been found that is guaranteed to completely withstand salt water. It is believed, however, that dense concrete and few if any construction joints will go a long way towards making concrete impervious.

Eleven culverts on the above named projects are under construction in salt marshes. By a special order from the Bridge Department, these culverts are being constructed of Class "A-A" concrete (1:1½:3 mix) and are being poured as a monolithic structure.

The usual way of pouring a concrete culvert—footing first and barrel and headwalls after the footing has set up—is generally known. The monolithic culvert is rather uncommon and the mode of construction may be noted with interest. The general scheme of construction that is employed by the contractor on Projects No. 200 and No. 201 for building monolithic culverts is a combination of ideas of all concerned as no one on either project had ever seen a monolithic culvert built.

Unfortunately, there is not a stable foundation in any of the salt marshes. First, therefore, it is necessary to drive bearing piles to carry the load. Incidentally, these piles are of great assistance in the construction of a timber floor which has to be built under the entire footing of all the culverts.

The footing of an ordinary culvert, where conditions demand, may be floored with pine slabs or other cheap lumber, then the footing poured and allowed to set up before the rest of the structure is completed. The footings of these monolithic culverts, however, must be floored with timber of sufficient bearing capacity to support the weight of the entire structure until the concrete sets up and the load is transferred directly on the piles.

After the piles are driven, the excavation is shaped up

and carried to an extra depth of about 8 inches to admit the floor stringers which are spiked to the piles. The floor is built with rough timbers the size of which varies with the span of the culvert. The floor under the barrel is made sufficiently wide to permit the side-wall forms to rest on it.

The entire set of forms for the culvert is built in place on the floor. The outside forms for the wall are braced to poles that are driven securely in the mud eight or ten feet from the structure. The inside or box form is built in sections and then set on the floor and bolted together on the inside. The box form is supported above the floor a distance equal to the thickness of the floor-slab by 1"x2" strips that are nailed to the studding inside the form. (When the box form is removed from the completed culvert, these 1"x2" strips are knocked loose from the studding and cut off flush with the floor-slab.) Planks for the top of the box, or that part which supports the top-slab of the culvert, are cut and fitted but not put in place until the footing and half the wall have been poured. Access to the footing while the concrete is being poured is thus permitted.

The steel for the footing is wired together in mats and laid on the floor before the barrel form is set in. It is supported in its proper position by being laid on precast concrete blocks or suspended by wires from the stringers in the box form. This steel is best supported by the concrete blocks. The blocks become completely imbedded in concrete, whereas, wire can be cut off only at the surface of the slab thus permitting an attack for salt water.

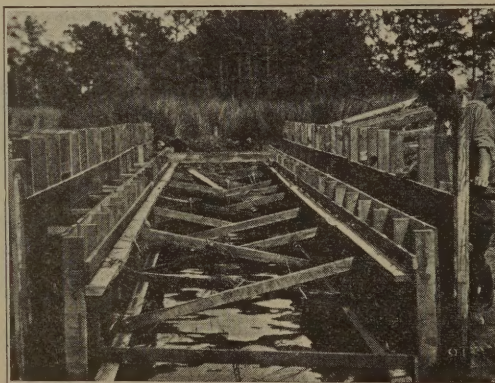
Steel for the top slab is wired together, usually in two mats, and laid in the wet concrete after a 3" layer has been poured on the top of the box.

Suspension of the steel in the walls offers no particular difficulty if the brace-wires running through the walls are so placed that they coincide with the horizontal steel. The horizontal steel may be fastened to the brace-wires and the vertical steel in turn fastened to the horizontal.

After the forms are completed and the steel is in place, the greater part of the job is done. Pouring the con-



SITE OF MONOLITHIC CULVERT BEARING PILES IN FOREGROUND—BUT NOT CUT OFF



FORMS FOR MONOLITHIC CULVERT

Highway Ordinances Passed by Commission

UNDER and by virtue of the provisions of Chapter 160, Public Laws of North Carolina, Session of the General Assembly, 1923, and particularly Section Ten thereof, and to prevent the abuse of the State highways, the State Highway Commission of North Carolina does ordain;

Section 1. No houses or other structure or substance weighing in excess of ten (10) tons shall be moved on or over the State highway, except by special and written permission of the State Highway Commission.

Sec. 2. No lumber, logs, cord wood, or other material shall be placed upon the pavement roadway or shoulders of the State highway, nor shall any material be placed in any manner thereon that will interfere with the drainage of the highway or the maintenance thereof.

Sec. 3. It shall be unlawful for any vehicle, engine, team, or contrivance whatsoever, to move upon any portion of the State Highway or Bridge thereof which has a flange, rib, clamp, or other object attached to its wheels or made a part thereof and which is likely to bruise, injure and mutilate the surface of such road or bridge without written permission first obtained from the State Highway Commission. This Section shall not be construed to prohibit tire chains of reasonable proportions on vehicles when required for safety and arising from conditions tending to cause such vehicle to slide or skid.

Sec. 4. No person shall throw or place, or cause to be thrown or placed upon any highway or bridge, any tacks, nails, wire, scrap metal, glass, crockery or other substance injurious to the feet of persons or animals or to tires or wheels of vehicles. Whoever accidentally, or by reason of an accident, drops from his hand or a vehicle any such substance upon any highway or bridge shall forthwith make all reasonable efforts to clear such highway or bridge of the same.

Sec. 5. No logs, ground sleds, or other objects shall be dragged along or across any portion of the State highway without permission of the State Highway Commission.

Sec. 6. No trucks or other vehicles shall be operated upon the State highway when the tires of which are worn to an extent as to cause damage to the highways because of any defective or worn condition.

Sec. 7. No log cart, or other similar vehicle using a tire of less width than four inches shall be permitted at any time upon the State highway without first obtaining a permit in writing from the State Highway Commission. And no person shall be permitted to transport, discs, or other types of harrows, on the State highway unless ample protection is made to prevent the tooth from cutting or otherwise mutilating the road surface.

Sec. 8. No vehicle shall be operated upon the State highway with two wheels on the edge of the hard surface of any highway, and the opposite wheels on the

shoulders thereof, for the purpose of retarding the speed of such vehicle. All vehicles shall be provided with sufficient brakes.

Sec. 9. No motor truck or other vehicle shall be loaded on any road while standing on the roadway and in a manner that will interfere with the traffic thereon or the maintenance thereof.

Sec. 10. No motor vehicle, shall remain on the roadway while being served by a filling station, garage or other service station.

Sec. 11. It shall be unlawful to repair any motor or other vehicle on the surfaced way of any roadway and in a manner which may impede or otherwise interfere with traffic or maintenance of the highway.

Sec. 12. No vehicle or other obstruction whatsoever shall be left standing in the roadway at night unless the same shall be protected by a proper light or lights on the same, and no disabled vehicle shall be left standing upon the highway for a longer period than ten (10) hours.

Sec. 13. It shall be unlawful for the driver of any motor or other vehicle to bring the same to a standstill side by side on the roadway, nor shall any two cars be parked in a manner that will impede or otherwise interfere with traffic upon the highway or hinder or otherwise interfere with the maintenance thereof.

Sec. 14. No advertising or other signs shall be erected on the highway or right of way thereof, so as to obstruct the vision or otherwise increase the hazard, and all signs shall be placed in a manner to be approved by the State Highway Commission.

Sec. 15. No person shall remove, injure or tamper with any signs placed by authorities of the State Highway Commission, or by any other officer or agent acting under its direction; nor shall any person operate any vehicle over a highway or bridge which is lawfully closed for construction or repairs, and contrary to posted notices, whether the work thereon is being done by the State or by a contractor, unless permit to pass is expressly granted by some person in charge of the work.

Sec. 16. The State Highway Commission may designate any portion of the State highway as a light traffic highway and restrict the weight carried thereon to such limit as it may deem proper, figuring on the basis of a given number of pounds per inch width of tire, per wheel or otherwise. Such roads shall be indicated by proper marks and it shall be unlawful, except by special and written permission of the State Highway Commission, to carry any greater weight upon the State highway so designated than that so prescribed and shown on the road signs.

Sec. 17. No vehicle, engine, contrivance, or other object of whatever character shall be moved upon or over any highway or bridge upon wheels, rollers, or

otherwise in excess of the weights prescribed for said light traffic road without first obtaining a written permit from the State Highway Commission.

Sec. 18. No motor or other vehicle having an overall width of more than ninety-six (96) inches shall be operated upon the State highway, unless by special and written permission of the State Highway Commission.

Sec. 19. No private drive or roadway shall be constructed to intersect any portion of the State highway unless adequate drainage shall be provided and in a manner to be approved by the State Highway Commission.

Sec. 20. It shall be unlawful for any person to use any part of the road as a turn-row nor shall any person be permitted to plow within the right of way.

Sec. 21. No fence or other object shall be erected on the right of way of the State highway and in a manner that will interfere with the drainage or maintenance thereof, nor in a manner tending to increase the hazard thereon.

Sec. 22. No material of whatsoever kind shall be placed in the ditches paralleling the State highway and in a manner that will interfere with the drainage thereof, and no person shall divert, or cause to be diverted, water into the road ditches and in a manner which may interfere with the drainage of the State highways or in any manner to cause damage thereto.

Sec. 23. No railroad, tramroad, or other road using rail of whatever character, shall construct a track across any portion of the State Highway System unless special permit is granted in writing by the Chairman of the State Highway Commission.

Sec. 24. Whoever operates a motor vehicle at the intersection of highways must keep to the right of the intersection of the center lines of the traveled part of such ways when turning to the left, except when traffic officers otherwise direct.

Sec. 25. No cars or other vehicles shall be permitted to park on bridges or fills constituting any part of the State Highway System.

Sec. 26. No person shall drive through any school zone, or other danger zone, designated on the State highway and at a greater rate of speed than that designated upon such zone signs.

Sec. 27. No vehicle shall be driven at a greater rate of speed than ten (10) miles an hour while crossing any wooden or steel bridge or bridges where warning sign is displayed, having a greater span than twenty (20) feet.

Sec. 28. All rural mail boxes shall be so placed as not to interfere with traffic or the maintenance of the State highway.

Sec. 29. Pedestrians walking on highways shall keep on the left hand side of the road.

Sec. 30. Any violation of the foregoing rules, regulations or ordinances, shall constitute a misdemeanor and be punishable as provided by Statute.

Sec. 31. That the foregoing ordinances shall be in full force and effect from and after July 15, 1923.

Duly read, approved and ratified this 30th day of June, 1923.

The General Assembly of North Carolina do enact:


Section 1. That no person, operating any motor vehicle on the public roads shall cross, or attempt to cross any railroad or interurban track intersecting the road at grade, other than a crossing at which there is a gate or a watchman (except an electric railway in the city, town or village) without first bringing said motor vehicle to a full stop at a distance not exceeding 50 feet from the nearest rail. That no failures so to stop, however, shall be considered contributory negligence per se in any action against the railroad or interurban company, for injuries of the person or property; but the facts relating to such failure to stop may be considered with the other facts in the case in determining whether the plaintiff was guilty of contributory negligence.

Sec. 2. That every railroad, or interurban company, operating or leasing any tract intersecting a public road at grade shall place a sign board, not less than 10 feet from the ground, on the right side of the road, 40 inches by 50 inches, 100 feet from said crossing which shall be painted with red lettering, to insure warning of the proximity of the crossing and notice to stop said vehicle, with the following "N. C. Law, Stop"; Provided this act shall not interfere with the regulations prescribed by towns and cities.

Sec. 3. That any person violating the provisions of this act shall be guilty of a misdemeanor and, upon conviction, shall be fined not more than \$10, or imprisoned not more than 10 days, or both, in the discretion of the Court.

Sec. 4. That this Act shall be in force from and after the first day of July, one thousand nine hundred and twenty-three. Ratified this 6th day of March, 1923.

Some Automobile Statistics

 THE number of motor cars and trucks registered in the United States in 1922 was 12,239,114. The number is about thirteen times greater than it was ten years ago, the number in 1912 being 944,000. Statistics began with 300 in 1895, rising to 28,755 in 1902.

The number for 1922 means one motor vehicle for 8.84 persons in the United States. In California there is one for every 4.29 persons. The actual number of vehicles is greater in New York than in California, but owing to the larger population, there is in New York one vehicle to 10.68 persons.

The number of motor cars and trucks in North Carolina in 1922 was 209,426; that is, one to 12 persons.

The number of motor vehicles made in the United States in 1922 was 2,561,000, while in 1912 the number was only 378,000; so in ten years the yearly production has increased sevenfold.

There were 14,000 persons reported as killed in automobile accidents in 1922.

Road Work in Hoke County

(Continued from page 5)

The predominating soil on the surface of the Flatwoods territory, like that of the Sand-hills, is sand. Sometimes this sand ranges in depth from a few inches to several feet. One borrow pit on the sandy end of Project 545 was twelve feet deep, and all of the material was sand. In most cases, however, this sand covers a natural sand clay material, which is an excellent surfacing soil.

No rock ever occurred on either of these Projects, in fact no bids were asked on any. The footings of all bridges are on piles, as the soil will not give the proper bearing power. The absence of rock proved to be advantageous when deep cuts were encountered, as the grading work could be pushed along without blasting or drilling.

Much timber used to grow in this part of the country, but most of it has been cut. Patches of timber are found here and there, and many of the open places contain huge stumps which are difficult to grub. The farmers have, in many instances, left the stumps standing, letting them decay until they are easier to get out. This fact caused the grubbing on both Project 544 and Project 545 to exceed the amount estimated.

Construction on Project 544, roadway, began in April, 1922. O. A. Mann & Co., of La-Grange, Ga., was awarded the contract, but sublet the work to Mr. J. A. Starke and to Mr. F. P. Holder, both of Ga. Each of these contractors had a force and equipment of about 20 men, 40 mules, 12 wheelers and a road machine.

Unskilled at first, these men were handicapped, but as the work progressed labor and mules were gradually whipped into shape. In addition to the fact that unskilled labor was used, many other difficulties arose at times. Huge gum and pine stumps, which were encountered in many places, could not be blasted on account of the nature of the soil around them. The soft, loose, sandy soil around the stumps would not give enough resistance to the charge, thereby only shaking the stump or in some instances, only splitting them. This peculiar feature demanded another method of grubbing stumps; so the old hand method was used throughout the entire job.

The nature of the soil had its difficulties as well as its advantages. Sandy cuts and boggy swamps impeded the progress of the mules and men. In some instances

cuts contained almost pure sand throughout their entire depth, tiring out the animals in a very short time, and delaying the work. Bogs were encountered in the swampy part of the country, so bad in some instances that the excavated material for the fills had to be "whipped" in, a method used in order that the mules might remain on the fill at all times.

The advantages afforded by the nature of the soil were enough to offset the disadvantages encountered. Sand in most cases was only two or three feet deep, under which was found a mixture of sand and clay, a material easy to handle under ordinary conditions without much wear on equipment. The smooth level cross-section of the land made it easy on the surveying party, who had to catch grade points between cuts and fills, and cross-section all borrow pits. This fact was also a great help to the grade foreman, who carried the grade between the stakes.



SAND-CLAY ROAD—PROJECT 545

Project 544, as mentioned before, is 10.3 miles of sand clay road, the surfacing being 16 feet wide and all fills and cuts having a width of 30 feet. There were 21,665 cubic yards of roadway excavation and 21,735 cubic yards of borrow, the latter predominating on account of the extremely low and flat places encountered, some of them a half of a mile long. 14,743 sta. yards of overhaul were necessary to soil over two stretches of road, one a long swamp and the other a long stretch of sandy territory. The material was hauled in wagons and wheelers for these places.

The bulk of the work was completed on Project 544 sometime in January, but being an extremely wet season of the year, it was sometime in May before the road could be

cleaned up and shaped for acceptance. Washouts had to be filled, brush burned, ditches cleaned out, and in a few places the surface had to be scarified and reshaped. A Holt Tractor, belonging to O. A. Mann & Co., and a large road machine were used for this work. Borrow pits had to be drained and shaped in an orderly fashion, and the roadway ditches having become ragged during the winter months had to be re-lined and shaped. After much shaping and finishing the Project was turned over to the State in May, 1923.

The Reinforced Concrete Bridges and Culverts on Project 544 were let in a separate contract from the roadway, the same being given to Chitwood and Carpenter of Charleston, S. C. They began work some-

time in May with a force of twelve men. Five of the six culverts were completed by July, and work was started on the bridge across Raft Swamp Creek, a Reinforced Concrete Deck Girder structure of two twenty-five foot spans.

Several difficulties arose during the construction of the bridge. When the footings were excavated to the elevation desired, a hard strata of marl was found. The use of this for foundations for reinforced concrete bridges is not permitted by the Bridge Department; so piles were ordered driven. Strange as it may seem an average penetration of 20 feet was obtained before the pile had the resistance capable of holding a 12 ton load. The marl strata proved to be only a few feet thick. When the piles were driven, the entire Project of six culverts and one bridge was completed by January 1, 1923.

Project 545, Roadway, consists of 9.1 miles of sand-clay road, surfacing 16 feet wide and a 30 foot roadway. Work on this project began in June, 1922 by O. A. Mann & Co., of LaGrange, Ga., the same contractor who had Project 544, but with his own outfit. The force and equipment consisted of about 20 men, 40 mules, 12 wheelers, 1 Holt Tractor, and two road machines.

This Project, although in the same physiographic division as Project 544, is in a more rolling locality. The first three miles of the Project, near the Drowning Creek Swamp, was the only difficult part of the road to build, as far as grading and soiling was concerned. One cut about 1,000 feet long and 8 feet deep contained nothing but loose sand. This sand was so bad in fact that one would feel the effects of walking through the cut very much when the end was reached. Three and four teams were kept in the shade at all times to relieve teams when they seemed to be suffering from the effects of their labors in this sand. This cut was soiled from ditch line to ditch line, a width of 30 feet, in order that traffic might never have trouble with this sand.

The first four miles of this Project was the swampiest part of the line. In one place, 11,000 cubic yards of borrow was used to construct a fill, 1 mile long, across one of these swamps. Much care had to be exercised in selecting the borrow pits for this fill, in order that they might be drained. This difficulty was overcome by selecting a spot as high as possible, and cutting only about two feet. Much area was necessary for this, but it proved advantageous as water was found at greater depths, and it saved the contractor the expense of digging long ditches to drain the pits.

All of the overhaul on the road was incurred in these first four miles. Being a swampy section, only white, gummy clay was found, but this was not used as it is not as good material as the yellow clay. Two of the pits of yellow clay selected were 120 stations apart and contained some of the best surfacing material used on the project. This material was hauled by means of wagons and four Maney Wheelers, the latter being operated by the Holt Tractor and two men. These wheelers

would automatically cut and load the material, each wheeler carrying about 1 cubic yard of it, which is double the volume carried by an ordinary wheeler. The overhaul on these four miles, the only overhaul on the entire job, amounted to over 85,000 sta. yards.

Grubbing was necessary on this Project, of about 13 acres and was handled in a more satisfactory manner than the grubbing on Project 544. About one-half of it was done with a stump puller, but this proved to be much slower than the method finally adopted on the latter half of the job. The Holt Tractor, equipped with about 200 feet of wire cable, would snatch up and pull off the average tree. Sometimes it was necessary to cut some of the roots of these trees and stumps to do this, but the Tractor proved the best means of grubbing, about 35 stations being done in a week.

The remaining five miles of the road caused few difficulties, all of the excavation being easy to handle, and suitable material for surfacing was found almost everywhere. Heavier cuts were encountered, which meant more yardage per mile of road.

Project No. 545, Roadway, was completed on July 7, 1923, and stands as one of the best pieces of sand-clay road in the State of North Carolina. Long grades and tangents, straight uniform roadway ditches, uniform cross-section, and a smooth easy riding surface are the pleasant features of the road. The best surfacing material that could be found was used, and test-holes dug at intervals of 1,000 feet apart proved that the proper thickness of this material is on the road. The secret of the beauty of the entire Project is that the contractor had a skilled force, and took as much interest in the construction of the road himself as did the engineers; the result is that he has left a piece of road which will be a monument to his credit as long as it lasts.

The Reinforced Concrete Bridge and Culvert work on this project was given to Mr. A. W. McClay of Richmond, Va. The contract called for 10 box culverts and a reinforced concrete deck girder bridge of 3 40 foot spans, the latter now under construction. Although the contract for the bridges and culverts and the roadway was let at the same time, it was October, 1922 before any concrete was poured, due to the inability of the contractor to secure labor and materials.

The only difficulty worthy of note, other than the one mentioned, was encountered when construction began on the bridge across Drowning Creek. This creek is surrounded by a very bad swamp, and keeping the water down within ordinary wooden sheet piling is a difficult job. Two double diaphragm pumps were tried at first, but they were unable to pump the water low enough; so finally a 4 inch centrifugal pump, operated by a Fordson Tractor was purchased. This pump alone handles the water in such a manner that concrete may be deposited in a footing with no fear whatsoever of the cement being washed out of the concrete,

Construction of Monolithic Culverts

Continued from page 10

crete is comparatively simple and means nothing more than a good, long day's work. With ample material at the mixer, a good supply of fresh water, and an early morning start, an 8'x4' culvert is completed in twelve hours with a one-bag mixer. In cool or moderately, warm weather the footing may be poured throughout the entire length of the culvert before a layer in the walls is started, but, if the weather is hot, care must be taken to add a shallow layer of concrete in the walls as the footing progresses. If this layer is not added, the first concrete poured in the footing will have obtained its initial set before the footing is completed and the wall started.

Rubbing of exposed surfaces to remove board marks left by the forms is not permitted. It is believed that concrete is more impervious when the surface is not disturbed by rubbing.

A good finish is obtained by first oiling the forms well before the concrete is poured and then tapping the forms

lightly with a hammer as the concrete is placed to assure a film of mortar next to the forms.

It may be said that monolithic culverts are no more difficult to build than ordinary culverts. They are more expensive, however, because of the necessity of building a strong timber floor, the extra work in suspending the steel and numerous other extra details the explanation of which is not permitted here because of limited space.

Great care in every detail is being maintained in the culverts. Only time will tell whether or not monolithic construction is going to lengthen the life of these structures in salt water.



FINISHED CULVERT—FORMS STILL IN PLACE

Down in the creek
Sleeps Jerry Bass;
The bridge was narrow,
He tried to pass.

"The average woman has a vocabulary of eight hundred words." It is a small stock, but think of the turnover.

Central Highway in Davidson County Under Construction

Continued from page 4

Project 528 lies between the towns of Lexington and Thomasville a distance of 10.24 miles. The contract for roadway consisting of 6'-8'-6" plain concrete pavement 18' wide was awarded to the Hagedorn Construction Company on September 26, 1922 and structures to J. A. Peterson on September 23, 1922.

Grading was started by the roadway contractor on October 2, 1922 and paving began eighteen days later at a point approximately 2 miles from Thomasville and poured to the town by December 13, 1922, when paving was discontinued for the winter months and resumed on March 26, 1923. During this time the contractors force was employed in grading, laying pipe lines, building headwalls and moving material plant from Thomasville to Lake which is a point on the Southern Railroad centrally located and adjacent to the project. All sand and stone used on this project has been purchased from commercial pits or quarries except about 300 cubic yards of sand obtained from a local pit. These materials are hauled from a central proportioning plant by means of a fleet of 1-ton Ford trucks, and cement is hauled in separate trucks and added to the batch at the mixer. Each Ford truck hauls sufficient material to make a 4½ bag batch of concrete 1:2:4 proportions. Other equipment consist of a Multi-Foote Concrete Mixer (type 21 E), Kelly-Springfield Rollers, and Meta Forms.

Since resuming paving this spring, approximately 5¼ miles have been poured and work is progressing satisfactorily. The outstanding features of this project is

the generally excellent material composing the sub-grade, the uniform consistency, and smooth finish of concrete, all of which make for good riding qualities of the finished road.

The Structures on project 528 consist of three Reinforced Concrete Deck Girder type varying from 125 to 167 feet span length. Work on Rich Fork Bridge was begun on October 10, 1922. Considerable delay has been caused by the high water and no little trouble has been experienced on foundations. Here the rock varied above and below the elevations shown on the plans. One abutment alone varied 15' in the dip of the rock, from one end of the abutment to the other. In this case some extra yardage was allowed the contractor while the higher side was blasted to an intermediate elevation determined by the Engineer in charge.

The bed of the stream and for some distance back from the banks the material excavated proved to be loose boulders and sand which gave considerable trouble in sinking the cofferdams which varied from 15 to 20 feet deep. The large amount of highwater and the regular tunnels that led from the bed of the stream very materially slowed up excavating and called for much patience but in the end, a good foundation was obtained. At present Rich Fork Bridge has all the substructure and part of the superstructure. Work is now under way on the substructure of all the bridges and the next three months, all going well will, see structures on project 528 nearing completion.

STATUS OF STATE WORK IN NORTH CAROLINA

Projects Under Construction

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
101	Beaufort.....	4.23	P. C.	\$ 145,492.76	1-20-23	Public Service Production Co.
105A	Beaufort.....	2.00	P. C.	78,839.42	11-11-22	J. I. McGhee Const. Co.
105B	Beaufort.....	5.037	P. C.	164,301.61	1-19-23	Public Service Production Co.
106	Bertie.....	7.12	T. S.	58,204.90	9-11-22	J. F. Mulligan Const. Co.—Boney & Hostetler.
107	Bertie.....	19.30	Graded	50,127.00	3-14-23	Nello Teer—Atlantic Bridge Co.
110	Camden.....	2.71	R. C.	134,866.48	7-11-22	State Forces
113B	Chowan.....	9.89	S. A.	100,000.00	4-9-23	State Forces.
115	Chowan- Perquimans....	11.83	P. C.	326,304.00	5-15-23	Smith Brothers, Inc.
129	Edgecombe.....	8.1	Graded	40,850.00	9-14-22	State Forces
131	Gates.....	15.95	T. S.	135,515.60	8-22-22	Bacon & Moore—W. D. Murray—Sadler Corp.
132	Gates.....	10.90	T. S.	63,921.00	8-29-22	J. A. Marrow.
133	Gates-Pasquotank.	14.07	Gravel	138,045.77	11-7-22	C. W. Lacy—Pittsburg Des Moines Steel Co.
137	Halifax.....	5.95	Bit Mac	180,441.92	11-21-21	O. F. Leighton—A. C. House.
138A	Halifax-North- ampton.....	12.59	& P. C. S. C.	131,712.13	5-1-22	Nello Teer—Richards Bros.
138B	Northampton- Halifax.....	12.88	Bridge	347,188.74	2-28-23	Pensacola Shipbuilding Co.
145	Hertford.....	12.88	Graded	88,161.42	7-31-22	Jameson & Bro.—Atlantic Bridge Co.
147	Hertford-Bertie..	17.36	Graded	122,245.86	3-5-23	Nello Teer—Atlantic Bridge Co.
151	Hyde.....	4.30	T. S.	71,422.28	12-10-21	C. W. Lacy—Porter & Peck.
152	Hyde.....	10.89	S. C.	75,651.40	1-15-23	O. A. Mann & Co.
154	Martin.....	11.27	A. C.	394,153.29	4-17-22	Sou. Willite Paving Co.—O. F. Leighton, Inc.
155	Martin-Pitt.....	20.01	T. S.	98,176.65	1-9-22	J. P. Dicus—J. M. Gregory.
155B	Martin.....	19.3	P. C.	493,900.40		W. T. Hadlow.
157A	Martin.....	12.50	T. S.	85,813.86	10-18-22	Jamison & Bro.—J. A. Marrow.
157B	Martin.....	12.50	T. S.	90,396.24	11-13-22	J. F. Mulligan Constr. Co.—Batson Cook Co.
159	Nash.....	11.22	T. S.	89,942.43	1-2-22	J. A. Kreis & Co.
163 ^(FA)	Nash.....	14.96	P. C.	409,592.40	6-15-23	Public Service Production Co.
167 ⁽¹⁴⁹⁾	Northampton....	20.48	T. S.	92,444.11	7-17-22	Virginia Contr. Co.—Bacon & Moore.
173	Perquimans-Pas- quotank.....	7.22	R. C.	239,444.70	8-25-22	Williams & Williams.
174	Pasquotank-Cam- den.....	2.40	Cord	55,818.01	4-3-22	D. E. Williams.
183A	Pitt.....	13.54	P. C.	399,854.40	11-13-22	S. J. Groves & Sons.
183B	Pitt.....		Bridge	32,343.30	3-27-22	B. J. Boyles.
184	Pitt.....	7.14	P. C.	206,516.42	11-21-22	Public Service Production Co.
185	Pitt.....	14.35	Graded	31,069.72	3-29-22	J. A. Marrow.
191	Tyrrell.....	6.91	S. C.	58,594.41	1-20-22	C. W. Lacy—M. M. Jones.
195	Washington.....	15.18	S. C.	65,619.35	2-28-22	L. M. Lee & Co.—B. J. Boyles.
196	Washington.....	14.93	S. C.	83,632.78	5-15-22	W. N. Thompson.
200	Carteret.....	13.68	Graded	79,629.00	7-21-22	Eagle Eng. Co.—Batson-Cooke Co.
201	Carteret.....	14.14	Graded	81,652.62	1-17-23	Duplin Constr. Co.—Batson Cooke Co.
210	Craven.....	8.34	A. C.	292,698.06	4-3-22	West Construction Co.—A. P. Gilbert.
219	Duplin-Lenoir....	15.60	Graded	148,339.29	6-1-21	Chitwood & Carpenter.
220	Wayne-Duplin....	14.53	A. C.	394,301.05	2-27-23	Union Paving Co.
236 ^(FA)	Johnson.....	14.83	A. C.	475,321.55	10-2-22	R. G. Lassiter & Co.
245 ⁽¹⁴³⁾	Jones.....	15.67	P. C.	265,179.53	3-22-22	Hyde & Baxter.
254	Lenoir.....		Bridge	73,415.32	11-22-22	Roanoke Iron & Bridge Co.
256	Lenoir.....		Bridges	57,680.00	1-11-23	Englehardt-Kuehen.
263	Pamlico.....	12.03	A. C.	289,324.20	3-27-22	Union Paving Co.
264	Craven-Pamlico..		Bridge	27,156.25	7-24-22	Rhyne & Kitchen.
272	Sampson.....	16.47	Graded	98,807.39	6-19-22	R. E. Martin—Striblin—Staudy & Newell.
273	Sampson.....	2.44	P. C.	96,916.82	2-27-23	Eagle Engineering Co.
275	Sampson.....		Bridges	8,769.74	4-4-23	Rhyne & Kitchen.
282	Wayne.....	14.22	A. C.	398,168.00	11-11-22	Union Paving Co.
291	Wilson.....	7.63	A. C.	203,498.18	1-17-22	P. R. Ashby.
291B	Wilson.....		Bridges	12,990.23	4-4-23	Jno. M. Ogden & Co., Road not let.
294	Wilson.....		Bridge	15,770.80	11-29-22	Stearns Bros.
300	Bladen.....	11.99	S. C.	64,911.71	4-8-22	T. W. Chandler—Nello Teer.
301	Bladen.....	13.17	T. S.	82,028.21	11-21-21	J. F. Mulligan—Powell Paving & Const. Co.
312	Brunswick.....	9.77	P. C.	347,319.68	7-5-22	Alabama Conc. Prod. Co.—Batson-Cooke Co.
313	Brunswick.....	3.44	A. C.	105,706.65	3-15-22	Sou. Willite Paving Co.—Roanoke Bridge & Iron Works.
314	Brunswick.....	15.82	S. C.	109,259.10	2-23-22	Hagedorn Const. Co.
316	Brunswick.....	12.12	S. C.	80,068.72	8-14-22	B. Frank Price—Batson, Cooke Co.
317	Brunswick.....		Bridge	19,783.20	11-30-22	Atlantic Bridge Co.
325	Columbus.....	11.22	T. S.	105,530.04	11-3-21	J. A. Kreis-Cornell-Young Co.
326	Columbus.....	13.61	S. C.	195,838.19	5-23-22	J. T. Plott—J. A. Kreis & Co.
327	Columbus.....	5.2	S. C.	38,269.44	6-21-22	J. A. Kreis.
328	Columbus.....	7.03	P. C.	219,371.68	12-26-22	L. L. Tindall
340	Cumberland.....	11.07	P. C.	381,032.02	6-15-22	Alabama Conc. Prod. Co.—Hobbs & Peabody.
342	Cumberland.....	5.91	A. C.	177,402.50	10-30-22	A. J. Wardrep.
351	New Hanover.....	10.64	A. C.	189,540.00	1-8-23	Southern Willite Paving Co.
363	Onslow.....	15.24	T. S.	208,476.95	3-5-23	Newell Constr. Co.—Pittsburg-Des Moines Steel Co.
364A	Onslow.....	9.95	S. C.	44,631.40	3-14-22	R. E. Martin.
364B	Onslow.....	12.84	T. S.	99,819.50	6-26-22	A. W. McClay.
376	Pender.....	7.64	Graded	94,757.85	11-11-21	C. G. Kershaw Const. Co.—Cornell Young Co.

STATUS OF STATE WORK IN NORTH CAROLINA---Continued

Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
377	Pender-Duplin....	1.61	S. C.	\$ 76,985.70	3-22-22	R. E. Martin-Hazell-Conerat-Quist Co.
378	Pender.....	14.12	W. B. Mac.	213,502.96	7-19-22	C. W. Lacy.
379	Pender.....	10.00	S. A.	100,000.00	5-22-22	State Forces.
380	Pender.....	8.98	W. B. Mac.	162,212.60	3-6-23	C. W. Lacy.
386-87	(F A-140) Robeson	19.8	P. C.	647,888.05	9-4-22	James O. Heyworth.
389	Robeson-Colum....	1.56	T. S.	83,463.38	10-26-21	L. A. Chitwood.
391A	Robeson.....	1.01	S. A.	43,332.08	4-3-23	R. G. Lassiter
391B	Robeson.....	1.10	T. S.	17,433.00	2-26-23	H. M. Beasley.
392	Robeson.....	1.06	T. S.	24,937.00	5-1-23	Robeson Co., Com.—E. T. Gwathney.
402	Chatham.....	6.92	T. S.	33,940.28	8-1-22	W. N. Thompson.
403	Chatham.....	7.01	T. S.	66,814.00	2-27-23	C. G. Kershaw.
412	Durham.....	8.80	P. C.	252,582.00	11-15-22	L. L. Tindall.
419	Franklin.....	12.82	T. S.	63,021.97	7-27-22	Jamison Bros.—J. M. Gregory.
428	Granville.....	4.19	R. C.	142,637.77	7-14-22	Pittman Const. Co.
429	Granville.....	6.94	P. C.	261,393.00	3-21-23	R. B. Sandige.
437	Harnett.....	10.74	Gravel	101,031.26	5-8-23	F. P. Holder—T. J. Newell.
456	Orange.....	9.81	Graded	37,459.07	1-7-22	Crawford & Crawford—Nello Teer.
457A	Orange.....	7.45	Graded	75,998.67	4-12-23	Dicus Bros.—Richards Bros.
460	Orange.....	9.87	A. C.	296,835.55	9-25-22	R. M. Hudson & Co.
463	Person.....	11.24	P. C.	327,171.35	8-14-22	Porter & Boyd.
473 ^(FA 146)	Vance.....	7.83	P. C.	265,546.60	7-11-22	R. G. Lassiter & Co.
481	Wake.....	7.40	A. C.	254,995.34	1-24-22	Union Paving Co.—P. R. Ashby.
484	Wake.....	8.79	P. C.	311,590.40	8-23-22	P. R. Ashby-Booz-Lloyd & Co.
485A	Wake.....	7.35	Graded	92,818.00	5-4-23	C. G. Kershaw Construction Co.—T. J. Newell.
486	Wake.....	9.04	T. S.	41,074.00	4-11-23	O. A. Mann & Co.
492	Warren.....	4.48	Bit Mac	100,436.13	4-10-22	Porter & Peck—A. C. House.
493	Warren.....	3.39	Bit Mac	77,866.80	7-27-22	Porter & Peck.
494 ^(FA 147)	Warren.....	6.21	A. C.	208,130.01	9-6-22	Clifford Engineering Co.
502	Alamance.....	17.43	T.S. & B.M.	138,629.97	7-17-22	W. E. Graham—Hanford Bros.
512	Caswell.....	11.67	T. S.	54,375.53	2-19-23	J. T. Plott.
522	Davidson.....	1.00	P. C.	37,856.50	6-29-23	Hagedorn Construction Co.
525	Davidson.....	10.24	A. C.	363,850.08	12-23-21	Elliott & Sons & Boggs—Austin Bros. Bridge Co.
528	Davidson.....	10.24	P. C.	427,511.92	10-2-22	Hagedorn Constr. Co.—J. A. Peterson.
532	Guilford.....	11.70	A. C.	385,957.88	2-1-22	Elliott-Sholes Co.
532B	Guilford.....	.....	Bridges	24,730.00	1-5-23	L. M. Lowdermilk.
535	Guilford.....	7.78	R. C.	277,955.21	4-19-22	Leaksville Lumber Co.
545	Hoke.....	9.15	T. S.	58,195.06	6-5-22	O. A. Mann & Co.—A. W. McClay.
555	Montgomery.....	20.55	T. S.	103,708.00	2-19-23	Mayfield Construction Co.—F. P. Holder.
569	Moore.....	18.97	S. C.	97,151.45	8-1-22	Mayfield Const. Co.
570	Moore.....	22.70	T. S.	90,804.33	5-22-23	A. B. McDonald.
577	Randolph.....	13.77	P. C.	422,343.57	4-18-22	Royer-Ferguson Co., Inc.—J. L. Brinkley.
578 ^(FA 156)	Randolph.....	7.91	P. C.	308,537.68	5-10-23	Allport Construction Corporation.
588	Rockingham.....	7.98	R. C.	266,498.43	4-11-22	Cheatwood & Driscoll.
589	Rockingham.....	9.81	P. C.	324,975.31	10-30-22	Cheatwood & Driscoll—Atlantic Bridge Co.
590	Rockingham.....	2.10	P. C.	66,062.18	6-15-23	Geo. R. Martin
593 ^(FA 38)	Rockingham-Caswell.....	17.98	P. C.	525,393.22	7-11-22	J. A. Kreis.
600	Alexander.....	9.3	Graded	12,530.98	5-26-22	Bolton Construction Co.
602	Alexander.....	9.28	Bit Mac	189,329.80	10-9-22	W. E. Graham.
606	Stanley-Anson.....	.....	Bridge	54,759.32	3-23-22	Concrete Steel Bridge Co.
607	Anson.....	6.39	T. S.	37,098.91	3-21-22	Geer & Wilson—Booz-Lloyd & Co.
608	Anson.....	7.88	A. C.	345,408.58	9-27-22	Lampton & Burks—J. A. Peterson.
614 ^(FA 144)	Cabarrus.....	9.20	P. C.	350,085.07	7-21-22	A. L. Harris—Oliver & Costello Bros.
615	Cabarrus.....	3.88	A. C.	98,741.17	3-9-23	Thompson-Caldwell—Atlantic Bridge Co.
616	Cabarrus.....	8.59	Gravel	46,024.00	4-12-23	Lee J. Smith—L. M. Lefler.
622	Catawba.....	10.85	A. C.	354,321.44	1-23-22	Union Paving Co.
629	Catawba.....	7.52	P. C.	268,662.48	6-5-22	A. L. Harris—R. M. Thurmond & Co.
630B	Gaston.....	6.65	A. C.	218,625.00	8-8-22	W. F. McCanless, Hobbs-Peabody Constr. Co.
632	Gaston.....	8.50	R. C.	291,868.94	1-2-22	Davis-Wilcox Const. Co.
633B	Gaston.....	3.8	A. C.	57,247.41	1-6-23	Gaston County.
639	Iredell.....	10.59	A. C.	387,346.19	1-2-22	R. M. Hudson Co.—Luten Bridge Co.
640	Iredell.....	8.17	Bit Mac	181,990.82	9-26-22	W. E. Graham.
643 ^(FA 157)	Iredell.....	8.57	A. C.	321,614.81	5-21-23	Stearns Brothers.
647	Lincoln.....	7.10	P. C.	250,108.15	6-5-22	A. L. Harris—R. M. Thurmond & Co.
653	Mecklenburg.....	8.84	A. C.	308,732.43	2-28-22	Union Paving Co.—Luten Bridge Co.
654	Mecklenburg.....	10.1	A. C.	302,887.09	4-3-22	Lampton & Burks.
658 ^(FA 145)	Mecklenburg.....	9.55	A. C.	266,758.80	10-9-22	Union Paving Co.
659	Mecklenburg.....	7.93	Graded	36,650.00	4-9-23	County Commissioners—Luten Bridge Co.
661	Richmond.....	9.76	T. S.	40,683.41	7-18-22	McDonald & Brooks.
665	Richmond.....	5.77	A. C.	194,501.23	7-28-22	A. J. Wardrep.
670	Cabarrus-Rowan..	4.53	P. C.	142,221.53	6-29-22	Harris Construction Company.
671	Rowan.....	7.34	A. C.	309,262.14	3-20-23	Thompson-Caldwell Construction Co.,—Atlantic Bridge Co.
673	Davidson-Rowan..	.59	Bridge	221,353.00	9-19-22	Hardaway Contracting Co.—Elliott & Sons.
677	Scotland-Robeson.	7.11	R. & P. C	283,460.61	4-26-22	P. R. Ashby—J. B. Murphy.
691	Union.....	.....	Bridge	14,520.00	2-13-23	J. S. Brinkley.

STATUS OF STATE WORK IN NORTH CAROLINA---Continued

Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	ESTIMATED COST	BEGUN	CONTRACTOR
694	Union.....		Bridge	\$ 23,549.13	11-14-22	Hagedorn Construction Co.
696	Union.....	6.05	A. C.	139,901.30	1-30-23	Redmon Construction Co.
700	Alleghany.....	7.90	W. B. Mac	132,297.33	6-23-21	W. E. Graham.
701	Alleghany-Wilkes..	8.00	W. B. Mac	166,245.20	6-16-21	W. E. Graham.
702A	Alleghany.....	7.75	BitMac&Grave	209,188.98	10-31-22	O'Brien Constr. Co.—Luten Bridge Co.
711	Ashe.....	6.50	Gravel	60,000.00	9-7-22	Little Contracting Co.
712	Ashe.....	11.06	Gravel	197,687.88	10-24-22	J. T. Plott.
713 ^(FA 139)	Ashe.....	3.53	P. C.	166,595.00	8-22-22	Overstreet & Nance—Concrete Steel Bridge Co.
724	Caldwell.....	4.66	T. S.	51,890.66	5-8-22	County Road Commrs—R. M. Thurmond & Co.
726	Caldwell.....	11.00	Gravel	50,000.00	5-5-23	State Forces.
726A						J. F. Mulligan Construction Co.
741	Forsyth.....	8.90	P & R. C.	315,025.81	7-27-22	Hardaway Construction Company.
742 ^(FA 137)	Forsyth.....	10.62	R. C.	413,067.27	6-20-22	Harris Construction Co.
743	Forsyth.....	11.35	A. C.	414,085.43	4-2-23	Atlantic Bitulithic Co.
744	Forsyth.....	2.00	T. S.	*	1-11-22	Forsyth County.
750	Stokes.....	14.86	T. S.	93,054.48	9-15-21	J. F. Mulligan Const. Co.—Lee J. Smith.
752	Stokes.....	9.67	T. S.	124,874.75	2-17-23	W. E. Graham.
761	Surry.....	2.22	P. C.	77,334.01	11-22-22	Geo. R. Martin.
765	Surry.....	3.40	P. C.	112,685.76	10-24-22	Campbell Constr. Co.
770A	Watauga.....	3.00	Bit-Mac.	40,000.00	8-12-22	State Forces.
770B	Watauga.....	8.90	Gravel	93,500.00	4-16-23	State Forces.
771A	Watauga.....	2.50	Bit. Mac	30,000.00	9-7-22	State Forces.
771B	Watauga.....	13.50	Gravel	35,000.00	9-7-22	State Forces.
780	Wilkes.....	7.83	Recon	25,000.00	7-25-21	J. F. Mulligan.—State Forces.
781	Wilkes.....	14.50	Recon	154,000.00	7-25-21	J. F. Mulligan.—State Forces.
782	Wilkes.....	5.97	R. C.	184,614.65	3-29-22	Hyde & Baxter.
783	Wilkes-Watauga..	36.00	Gravel	174,900.00	9-2-21	Chandler & Ragland
784	Wilkes.....	4.97	T. S.	85,966.21	8-30-22	J. F. Mulligan Constr. Co.—Foster Constr. Co.
785	Wilkes.....	2.52	P. C.	78,703.50	4-2-23	J. D. Brookshire & Co
790	Yadkin.....	10.12	P. C.	330,254.27	4-24-22	Pittman Construction Co.
800	Avery.....	5.84	Grav & R C	198,827.02	7-31-22	O'Brien Const. Co.—J. A. Kreis.
811	Burke.....	5.24	P. C.	185,132.97	1-13-22	Southern Dray Co.
812	Burke.....	4.89	Grading	58,629.01	7-6-23	M. A. Kolloch—Padgett & Justice.
815	Burke-Clev'nd.-Lincoln	11.63	T. S.	153,126.60	4-28-22	Geer & Wilson—J. L. Van Glahn.
821	Cleveland.....	1.58	P. C.	60,192.33	10-31-22	Davis-Wilcox Constr. Co.
822 ^(FA 150)	Cleveland.....	10.47	A. C.	404,444.48	9-27-22	Elliott & Sons—J. A. Kreis & Co.
833	Henderson.....	5.20	Gravel	34,952.94	1-3-22	S. L. Davis Const. Co.—Asheville Const. Co.
835	Henderson.....	6.97	W. B. Mac	281,162.75	6-9-23	J. B. Ross, Jr.—R. C. Stevens.
836	Henderson.....	9.10	Grading	145,686.75	7-13-23	J. B. Hawkins—W. M. Brown.
846	McDowell.....	10.06	Gravel	204,680.74	9-22-21	Asheville Const. Co.—W. T. Taylor Const. Co.
847	McDowell.....	3.84	Graded	91,217.50	10-19-22	C. W. Lacy—Oliver & Costello Bros.
848	McDowell.....		Bridge	18,597.04	11-21-22	R. M. Thurmond & Co.
856	Mitchell.....	6.88	Bit Mac	239,343.83	3-20-22	Porter & Boyd—L. J. Chandler & Co.
858	Mitchell.....		Bridge	42,367.49	10-2-22	R. M. Thurmond & Co.
860	Mitchell.....	5.65	W. B. Mac	152,908.42	4-21-22	J. F. Mulligan—W. H. Anderson Const. Co.
876 ^(FA 788)	Rutherford.....	4.80	P. C.	146,264.80	10-30-22	Fiske-Carter Construction Co.
882	Rutherford.....	15.80	T. S.	94,666.00	9-20-22	C. R. Willard & Sons.
888	Yancey.....	15.22	W. B. Mac	230,499.94	10-10-22	The Luck Co.
901 ^(FA 148)	Buncombe.....	7.52	P. C.	354,082.45	11-6-22	R. C. Stephens—A. J. Wardrep.
903	Buncombe.....	2.58	A. C.	100,399.47	4-10-22	Asheville Paving Co.—R. C. Stevens.
911	Cherokee.....	10.33	Gravel	144,991.44	10-25-21	H. A. Wells—Southern Dray Co.
913	Cherokee.....	10.33	W. B. Mac	95,554.80	8-8-22	Mills, Williams Construction Company.
920	Clay.....	5.01	Gravel	50,716.66	1-9-22	E. A. Wilson & Co.—W. T. Moore Conc. Prod. Co.
921	Clay.....	12.37	Gravel	99,988.02	10-24-21	Lee J. Smith Const. Co.—W. T. Moore Conc. Prod. Co.
930	Graham.....	12.90	Gravel	143,574.20	10-15-21	Lee J. Smith Const. Co.—C. M. Dicus.
940	Haywood.....	7.13	W. B. Mac	126,069.30	4-14-22	Alexander & Patton—H. A. Brown & Co.
944 ^(FA 16)	Haywood.....	10.18	A. C.	409,683.45	5-14-23	A. J. Wardrep.
950	Jackson.....	7.56	Gravel	145,313.30	6-13-21	Wright & Nave—O'Brien Const. Co.
951	Jackson.....	11.85	W. B. Mac	249,546.00	8-17-22	R. H. Wright & Sons—W. T. Moore Conc. Prod. Co.
952A	Jackson.....	10.35	Graded	164,126.60	8-17-22	Brooks-Calloway Company.
953	Jackson.....	12.72	Graded	118,186.75	7-1-22	C. C. McCabe.
954	Jackson.....	1.68	P. C.	90,871.77	7-1-22	Mills, Williams Construction Company.
960	Macon.....	4.97	S. C.	69,100.57	6-6-21	J. T. Plott—J. E. Lane & Co.
961	Macon.....	4.77	T. S.	58,340.59	12-5-21	J. T. Plott—J. E. Lane & Co.
962	Macon.....	13.58	W. B. Mac	171,200.05	4-24-22	O'Brien Const. Co.—Griffin Const. Co.
963	Macon.....	8.68	Graded	124,354.01	11-10-22	Costello Bros.—Brooks-Calloway Co.
970	Madison-Yancey..	13.80	W. B. Mac	218,940.17	11-11-21	R. H. Wright & Sons—O'Brien Const. Co.
971	Madison.....	6.74	Gravel	114,026.00	4-23-23	Reynolds Const. Co.—Moore Concrete Prod. Co.
972	Madison.....	7.00	Graded	9,000.00	4-6-23	State Forces.
980	Macon-Swain.....	17.84	W. B. Mac	350,175.11	3-20-22	Costello Bros.—Condon & Condon.
990	Transylvania.....	8.87	W. B. Mac	151,238.89	6-5-22	Sam L. Davis Const. Co.—R. C. Stevens.
991	Transylvania.....	7.03	Graded	156,653.20	3-6-23	Gibson Construction Co.

*Built by county.

STATUS OF STATE WORK IN NORTH CAROLINA---Continued

Projects Completed

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
100	Beaufort.....	10.50	R. C.	\$ 369,777.70	3-15-23	W. T. Hadlow
103	Beaufort.....	.03	R. C.	1,706.75	7-3-22	R. G. Lassiter.
113	Chowan.....	10.32	Graded	39,743.33	3-1-23	Nello Teer—Gregory & Talbot.
114	Chowan.....	10.40	Graded	45,064.09	4-14-23	Battershill & Goode—Chandler & Ragland.
125	Edgecombe.....	15.11	A. C.	426,438.76	4-23-23	R. G. Lassiter.
139	Halifax.....		Bridge	*20,425.59	8-25-22	Chandler & Ragland—Porter & Peck.
140	Halifax.....		Bridge	*11,043.05	5-5-22	Von Glahn & Talbott.
160	Frklin.-Wake-Nash	8.93	T. S.	53,722.95	3-7-23	Chandler & Ragland—Southern Dray Co.
166	Northampton.....	.47	Bridge	17,954.75	9-14-22	W. D. Murrey—Sadler Corp.
175	Pasquotank.....	9.50	Brick	217,405.72	4-19-23	County Commissioners.
186	Pitt.....	9.57	R. C.	*248,103.78	8-5-22	Cheatwood & Driscoll.
209	Craven.....	2.65	P. & R. C.	*114,569.02	2-15-22	Eagle Engineering Co.
211	Craven.....	9.93	A. C.	288,946.02	5-16-23	Union Paving Co.
218	Wayne-Duplin.....	16.06	Graded	92,589.58	2-24-23	C. W. Lacy.
227	Greene.....	6.81	A. C.	239,797.80	1-25-23	West Construction Co.—Union Paving Co.
255	Lenoir.....	0.82	S. A.	30,384.89	8-18-22	West Construction Co.
280	Wayne.....	10.01	A. C.	311,352.36	5-12-23	Union Paving Co.
281	Wayne.....		Bridge	*21,225.49	1-15-23	P. R. Ashby.
338	Cumb.-Samson.....		Bridge	26,323.99	9-26-22	Roanoke Bridge & Iron Works.
339	Harnett-Cumb.....	.754	T. S.	19,067.28	8-31-22	Porter & Boyd
341	Cumb.-Hoke.....	.2	Graded	*1,042.55	2-28-22	W. B. Covington
375	Pender.....	13.56	S. C.	68,830.09	11-21-22	A. W. McClay
388	Robeson.....	3.35	R. C.	137,009.40	9-28-22	C. W. Lacy—Roanoke Bridge & Iron Co.
400	Chatham.....		Bridge	57,420.22	5-18-23	R. M. Walker & Co.
409	Durham.....	0.5	Graded	*5,409.10	8-7-22	J. P. Dicus.
410	Durham.....	2.3	R. C.	*81,105.75	9-28-22	C. D. Riggsbee.
411	Durham.....	5.81	P. C.	211,574.92	7-12-23	Hutton Engineering and Construction Co.
420	Franklin.....	1.56	R. C.	55,421.30	5-29-23	Chandler & Ragland.
427	Granville.....	5.12	A. C.	178,257.64	1-4-23	R. G. Lassiter & Co.
436	Harnett.....	21.91	Gravel	202,563.88	1-15-23	C. G. Kershaw Const. Co.—Hobbs & Kitchen.
445	Lee.....	5.91	T. S.	18,692.85	1-15-23	C. B. Hester.
446	Lee.....	5.90	A. C.	197,188.22	1-15-23	Atlantic Bitulithic Co.—O. A. Mann & Co.
453	Orange.....		Bridge	33,706.80	1-9-23	Geo. W. Kane.
454	Orange.....	4.28	P. C.	197,675.32	3-6-22	Elliott, Sholes & Teer.
455	Orange.....	4.19	T. S.	*55,214.44	9-28-22	J. F. Mulligan Const. Co.—P. R. Ashby.
482	Wake.....	6.64	A. C.	*184,393.31	9-23-22	R. M. Hudson Company.
483	Wake.....	0.54	R. C.	*15,630.74	8-7-22	C. D. Riggsbee.
500	Alamance.....	5.22	Graded	*36,844.34	1-17-22	W. W. Tuck & Son—A. M. Hazell, Connerate—Quist Construction Co.
501	Alamance.....	13.1	T. S.	30,927.27	2-28-23	W. M. Shook-Hanford Bros.
503	Alamance.....		Bridge	59,450.38	7-20-23	Atlantic Bridge Co.
504	Alamance.....	5.22	A. C.	154,127.16	5-3-23	Elliot & Sholes.
505	Alamance.....	0.42	S. A.	*15,229.74	6-23-22	Hedrick Construction Co.
511	Caswell.....	14.80	T. S.	73,242.18	10-11-22	White & Simpson-C. B. Hester
524	Davidson.....	0.3	S. A.	*9,941.54	1-20-22	Town of Lexington.
525A	Davidson.....	.5	S. A.	*16,419.86	6-27-21	Town of Lexington.
526	Davidson.....	3.77	P. C.	*131,269.66	10-25-22	Hagedorn Constr. Co.—Heilig & Sherrill.
533	Guilford-Forsyth.....	10.59	P. C.	427,997.62	7-23-23	Royer-Ferguson Construction Co.
538	Guilford.....		Bridge	7,039.01	2-21-23	J. L. Brinkley.
539	Guilford.....	0.64	S. A.	21,639.20	1-19-23	Robt. G. Lassiter & Co.
540	Guilford.....	18.00	Recon.	16,527.54	1-23-22	J. T. Plott.
544	Hoke.....	10.45	S. C.	32,445.49	5-3-23	O. A. Mann & Co.—Chitwood & Carpenter.
546	Hoke.....	0.84	S. A.	27,949.00	5-30-23	Dawkins Construction Co.
566	Moore.....	7.14	T. S.	62,079.21	6-30-23	Gibson Construction Co.—Nello Teer.
567	Moore.....	2.96	T. S.	*9,967.53	9-18-22	C. E. Teague.
601	Alexander.....	3.07	T. S.	33,630.45	3-31-23	Guss Ginn-R. M. Thurmond
630A	Gaston.....	3.02	A. C.	*98,854.41	7- -22	W. F. McCanless.
633A	Gaston.....	13.77	A. C.	180,000.00	10-5-22	Gaston County
634	Gaston.....		Bridge	4,500.00	.....	State Forces.
638	Iredell.....	7.88	A. C.	262,142.65	1-20-23	Thompson-Caldwell Co.
652	Mecklenburg.....		Bridge	1,923.28	10-30-22	State Forces.
655	Mecklenburg.....	1.57	P. C.	63,695.17	7-31-22	Speed-Parker Co., Inc.—Luten Bridge Co.
656	Mecklenburg.....	10.4	Bit.-Mac.	200,000.00	10-30-22	State Forces.
657	Mecklenburg.....	13.80	Recon.	20,000.00	10-30-22	State Forces.
692	Union.....	2.28	A. C.	*65,279.20	12-28-21	Redmon Construction Co.
693	Union.....	1.14	Gravel	3,324.48	.....	Sykes-Collins Co.
695	Union.....	4.51	A. C.	*138,738.07	9-14-22	Redmon Construction Co.
710	Ashe.....	3.14	P. C.	*142,707.93	8-17-22	Pittman Construction Co.
719	Caldwell.....		Bridge	*7,906.87	6-26-22	Cottrell & Howard.
719B	Caldwell.....	.99	Gravel	1,665.33	11-15-22	J. G. Bumgardner
722	Caldwell.....	7.40	Recon	*20,923.25	1-18-22	County Forces.
724	Caldwell.....	4.66	T. S.	51,890.66	4-13-23	County Forces—R. M. Thurmond & Co.
725	Caldwell.....	4.00	Recon	28,015.46	2-24-23	County Commissioners.
731	Davie.....	5.46	P. C.	195,393.11	7-21-23	G. R. Martin—Heilig & Sherrill.
751	Stokes.....	7.16	T. S.	*35,124.08	10-4-21	W. E. Graham.
760	Surry-Alleghany.....	6.9	T. S.	*32,084.18	11-5-22	W. E. Graham.
764	Surry.....	1.63	R. C.	50,588.20	2-4-23	Leaksville Lumber Co.

(*Final Cost)

STATUS OF STATE WORK IN NORTH CAROLINA---Continued

Projects Completed—Continued

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
801	Avery.....	.99	W. B. Mac	\$ 22,350.24	10-26-22	Geer & Wilson.
814	Burke.....	8.69	S. C.	13,459.60	4-25-23	M. A. Kollock.
823	Cleveland.....	1.90	P. C.	*80,421.65	8-15-22	Southern Paving Co.—Z. B. Weathers & Son.
844	McDowell.....	1.8	P. C.	*61,233.34	12-13-21	Bolton Construction Co.
845	McDowell.....	7.19	Gravel	132,177.93	12-22-22	J. W. Stapp Constr. Co.—Praytor, Howton & Wood
855	Mitchell.....	4.97	P. C.	174,393.78	4-17-23	Fisk-Carter Construction Co.
855B	Mitchell.....		Bridge	*22,699.85	8-22-22	Luten Bridge Co.
866	Polk.....	5.96	Bit Mac	180,393.40	11-21-22	Southern Paving Co.—Henry Constr. Co.
875	Rutherford.....		Bridge	*6,151.61	7-18-22	Geer & Wilson
877	Rutherford.....	9.79	T. S.	64,563.73	8-7-22	Geer & Wilson.
878	Rutherford.....	6.55	T. S.	44,984.50	10-27-22	Michaux Const. Co.—Geer & Wilson.
879	Rutherford.....		Bridge	*6,781.99	6-21-22	Austin Bros. Bridge Co.
880	Rutherford.....		Bridge	24,679.43	3-23-23	Austin Bros. Bridge Co.
904	Buncombe.....	1.60	A. C.	80,969.13	6-23-23	Asheville Paving Co.—R. C. Stevens.
910	Cherokee.....	7.56	Gravel	76,743.59	2-24-23	Ross Bros. Constr. Co.—W. T. Moore Concrete Prod. Co.
942	Haywood.....	0.57	Gravel	*6,490.43	2-1-22	O'Brien Construction Co.

PROJECTS UNDER CONTRACT

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	CONTRACTOR
141	Halifax-Edgecombe	18.76	T. S.	\$ 220,679.58	J. P. Dicus—J. A. Peterson.
146	Hertford-Bertie...	6.42	T. S.	60,772.14	Atlantic Bridge Co.—Nello Teer.
168	Northampton.....	16.30	T. S.	107,229.87	Nello Teer.
189	Pitt.....	5.30	P. C.	210,247.07	Smith Bros., Inc.—Pittsburg Des Moines Steel Co.
213	Craven.....	10.43	A. C.	447,053.53	F. G. McGuire & Eagle Engineering Co.
230	Greene.....	5.40	P. C.	220,576.18	Smith Bros., Inc.—Pittsburg Des Moines Steel Co.
291C	Wilson.....	.31	Grade	15,532.00	C. S. Wheeler.
293	Wilson.....	8.99	P. C.	384,222.08	Smith Bros., Inc.—Pittsburg Des Moines Steel Co.
295	Wilson.....	9.92	Recon.	124,060.64	Highway Engineering and Construction Co.
329 ^{FA} ₁₅₅	Columbus.....	12.88	A. C.	422,462.60	Jas. L. Hayworth.
400A	Chatham.....		Grading	5,400.00	C. B. Hester. (fill)
431	Granville.....	3.83	T. S.	42,895.71	Michaux Construction Co.
438	Harnett.....	3.82	P. C.	152,114.88	J. M. Gregory—T. J. Newell.
464	Person.....	11.58	T. S.	86,268.71	Michaux Construction Co.
484B	Wake.....		Bridge	13,060.19	Booz-Boyd & Co.
485C	Wake.....	.51	Grading	10,452.00	Nello Teer. (fill)...
506A	Alamance.....	.32	Grading	9,866.45	Nelo Teer. ...
532C	Guilford.....	.50	P. C.	12,650.00	W. B. Kiker.
541	Guilford.....	4.31	Bit. Mac.	119,469.24	Hagedorn Construction Co.
556	Montgomery.....	3.07	Bit. Mac.	78,821.60	J. F. Mulligan Construction Co.
608B	Anson.....	3.83	Grading	48,646.51	Ben. F. Teeter—J. A. Peterson.
672	Rowan.....	3.54	A. C.	167,756.27	Stearns Bros. Inc.—J. A. Kries.
702B	Alleghany.....	6.49	Gravel	191,737.26	Turner-Hartsoe-Luten Bridge Co.
802	Avery.....	5.68	Grading	98,043.44	Hughes & Rae.
837B	Henderson.....	5.83	A. C.	83,113.14	Dixon Construction Co.
882B	Rutherford.....		Bridge	10,582.00	Michaux Construction Co.
930A	Graham.....	2.92	Gravel	12,243.00	C. M. Dicus.

STATUS OF FEDERAL AID WORK IN NORTH CAROLINA

Projects Under Construction

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
15	Guilford.....	4.205	Bit. Mac.	\$ 5,441.75	9-1-17	County Commissioners.
61	New Hanover.....	2.186	P. C.	234,841.39	7-12-20	C. W. Lacy.
69	Transylvania.....	9.348	W. B. Mac.	231,409.04	3-25-20	Allport & Alexander Construction Co.
94A	Mitchell.....	5.04	W. B. Mac.	190,375.13	6-22-20	Gibson Construction Co.
125A	Alleghany.....	4.99	Bit. Mac.	153,899.13	11-22-21	W. E. Graham.

Summary

WORK UNDER CONTRACT

Type	STATE		FEDERAL AID	
	Length	Cost	Length	Cost
P. C.....	24.01	\$ 979,810.21		\$
A. C.....	32.68	1,120,385.54		
Bit. Mac.....	7.38	198,290.84		
T. S.....	56.89	517,846.01		
Gravel.....	9.41	203,980.26		
Graded.....	10.65	187,940.40		
Recon.....	9.92	124,060.64		
Bridges.....		23,642.19		
Total.....	150.94	\$ 3,355,956.09		

WORK UNDER CONSTRUCTION

P. C.....	330.09	\$ 10,641,722.82	2.19	\$ 234,841.39
R. C.....	67.92	2,433,241.08		
A. C.....	282.71	9,063,837.76		
S. A.....	20.90	243,332.08		
Bit. Mac.....	51.40	1,248,598.28	9.19	159,340.88
W. B. Mac.....	150.24	2,701,553.52	14.39	421,784.17
T. S.....	368.31	2,745,890.19		
S. C.....	154.74	1,191,426.35		
Gravel.....	190.53	1,834,431.71		
Graded.....	245.56	1,922,127.69		
Recon.....	22.33	179,000.00		
Cord.....	2.40	55,818.01		
Bridges.....		981,069.56		
Total.....	1,887.13	\$ 35,242,049.05	25.77	\$ 815,966.44

WORK COMPLETED

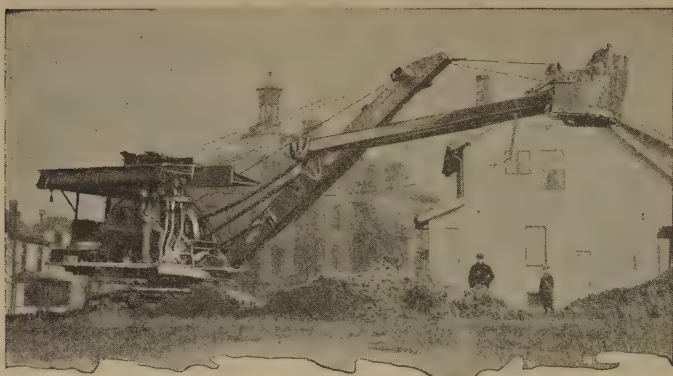
P. C.....	45.94	\$ 1,800,931.52	26.56	\$ 889,940.67
R. C.....	29.48	959,343.62		
A. C.....	97.80	2,806,484.73	42.29	1,521,368.25
S. A.....	3.52	121,564.23	22.91	763,048.82
Bit. Mac.....	16.36	380,393.40	30.62	798,895.02
W. B. Mac.....	.99	22,350.24	14.00	303,505.78
Brick.....	9.50	217,405.72		
T. S.....	95.91	585,191.31	509.18	5,228,132.54
S. C.....	32.70	114,735.18	83.90	785,198.22
Gravel.....	39.36	522,965.64	42.56	488,699.18
Graded.....	43.17	226,090.69	29.23	252,426.17
Recon.....	43.20	89,966.25		
Bridges.....		319,334.61		651,051.10
Total.....	457.93	\$ 8,166,757.14	801.25	\$ 11,682,265.75

Total Roadway Mileage 3,323.02. Total estimated cost of Roadway \$57,267,897.01. Total estimated cost of Bridges \$1,975,097.46. Corrected to August 1, 1923.

LEGEND

P. C.—*Plain Concrete. R. C.—*Reinforced Concrete. A. C.—*Asphaltic Concrete. S. A.—*Sheet Asphalt. Bit. Mac.—*Bituminous Macadam. W. B. Mac.—*Water Bound Macadam. T. S.—†Top Soil. S. C.—†Sand Clay. Gravel—†Gravel. Graded—†Graded. Recon.—†Reconstruction. Cord.—†Corduroy.

* Hard Surface. † "G" Type.



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GLANCE OVER THIS LIST OF P & H SHOVELS FEATURES

1. The P & H crowding motion is controlled independently of the hoisting effort, all the power available at any dipper position.

2. The P & H crowd is sufficient to allow dipper stick to be extended when dipper is in highest loaded position. The dipper can be pushed out as it breaks through top of bank.

3. The power back of the P & H crowd and the design of the P & H crowding mechanism allows raising the dipper above boom point sheave. After cutting through top of bank, dipper of P & H Shovel can be extended to load wagon or truck.

4. The P & H has large digging radius.

5. Dipper moved backward and forward rapidly.

6. Simple rugged fool-proof mechanism.

These features are fully explained in the new Bulletin 58-X, and scores of photographs showing how contractors are using P & H excavating equipment are also included. Tell us where to send your copy.

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Hyde Highway Opens Rich Country

Continued from page 9

Extension to the County line at Leechville, has been classified as Project 152, and shortens the present road of nearly 14 miles to 10.9 miles. Structures and roadway were both let to O. A. Mann & Co., of LaGrange, Ga., in November, 1922. Construction was begun on the roadway in February, 1923, and is now well under way. Borrow fills across Leechville and Scranton marshes are to be constructed with narrow gauge dump car equipment. Excavation and loading with Keystone Excavator. In order to get an early start on the Leechville Marsh fill, the contractor began work there as soon as his excavator arrived using mules to pull the dump cars; two 2-yard cars to the mule. This method was possible on account of the flat grade of the track, and will probably be continued until a more modern means is devised.

A large portion of the lower end of the Project is being constructed on the "Boulevard," section, a side borrow extending from the shoulder of the road to a back sloped side ditch about 30 feet from center line. This method used as means of abolishing borrow pits, and to facilitate side drainage. The entire width of road when machined, presents the pleasing appearance of a wide boulevard, hence the name.

Treated timber structures are to be constructed over Rutman's, Wilkinson's, and Broad Creeks. Test piles have been driven to determine length of piling necessary for safe bearing pressure; this having run between 40 and 30 feet. A treated timber bridge with steel draw span is to be built over the Pungo River at Leechville connecting Project 152 with Beaufort County. This bridge to be built by the State Forces.

Road Work in Hoke County

Continued from page 14

if a little care is exercised in placing forms. At the present writing almost all of the substructure of the bridge is finished, and with good luck the contractor will complete the structure in about 60 days.

Project No. 546 is a Sheet Asphalt Pavement on a 5-inch concrete base, and was built in conjunction with the city who paid for all work other than the 18 feet through the center of the street. This is the Main Street in Raeford and was built 70 feet wide with curb and gutter. The city employed an engineer for their part of the work, but everything in the way of paving was done as per the specifications of the N. C. State Highway Commission. This Project was started in December, and owing to the extremely mild temperature of this particular locality, no stops were made on account of cold weather. The contractor, Dawkins Construction Corporation of Norfolk, Va., completed this Project, one-half of a mile in length, and several connecting streets by the first of June, 1923.

Much road construction has been completed in Hoke County since April, 1922, and the result is that the county has 30 miles of good highway, 10 miles having been built in 1920-1921. There remains only one stretch of road to be built, which when done will give Hoke County her share of State Roads, according to the schedule of the Commission. This road, from Raeford to the Hoke-Moore county line, at present, is in a good condition.

Which Are You Going to Pay?

50c PER YARD for shoveling crushed stone into trucks by hand? A good man can load 12-15 cu. yds. in 10 hours—it will cost you 25c per yard for labor alone. And don't overlook the other 25c that it's costing to hold your truck waiting for this slow method of loading.

DON'T make the mistake of figuring on the old fashioned hand loading. Someone will bid in the contracts on a lower estimate and still make a long profit by being wise to the economies of hand loading.

There's a little bulletin "How Haiss Truck Loaders Make Roadbuilding More Profitable" that has honest-to-goodness facts in it. Want a copy?

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Tractor & Machinery Sales Co.

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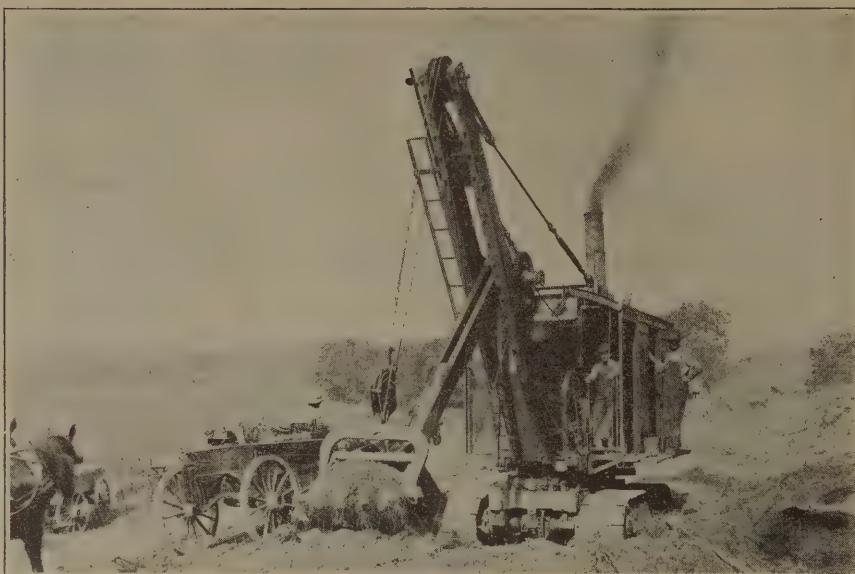
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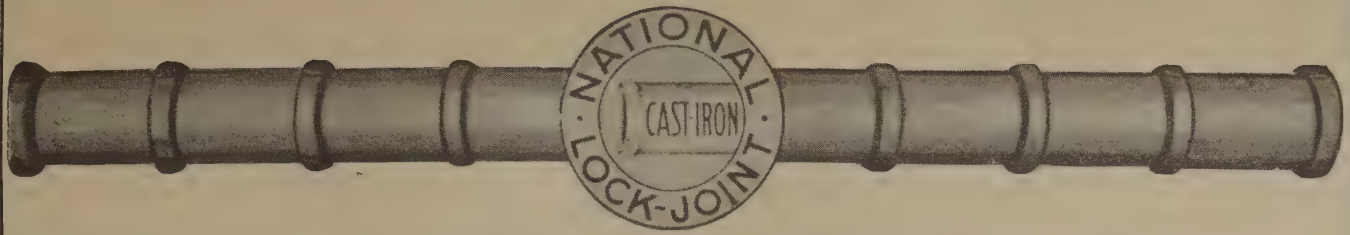
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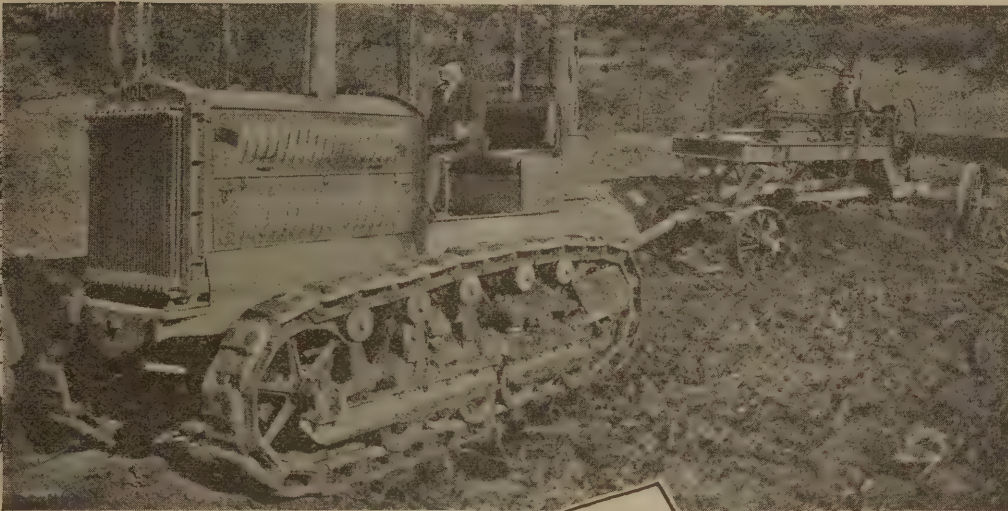
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BUNCOMB COUNTY COMMISSIONERS
ASHEVILLE N.C. MAY 15th 1923

Some time ago the Commissioners of Buncomb County decided that there must be some faster, better and more economical way to widen and maintain County roads than by the old mule and hand labor method. After some investigation we decided to use tractors and the next thing for us to decide was what tractor and what grader would do the most work for the least amount of money for upkeep and operation, as we realized that the first cost is usually the small end of equipment.

We advertised for bids and found that there were more makes of tractors and graders than we had ever dreamed of. After several trips and much investigation, both mechanical and as to service, we decided to purchase one Holt Caterpillar Tractor and one Stockland Giant Quicklift Twelve Foot Grader. for our heavy outfit.

This equipment was delivered and put to work in a very short time after the order was given. We have been surprised our fondest hopes were given. The tractor is flexible, easy riding and has abundant power for the heaviest mounding it is very fast for such a large machine. The Grader is equally as strong as the tractor and three speeds forward and spring action. We find that the Quicklift is a great time-saver, as you do not have to stop for bridges and culverts. After using this combination on our own County roads, we are thoroughly convinced that we made the right selection and we would heartily advise any County to profit by our experience and do likewise.

Buncomb County Commissioners.
E. M. Lyda
Chairman

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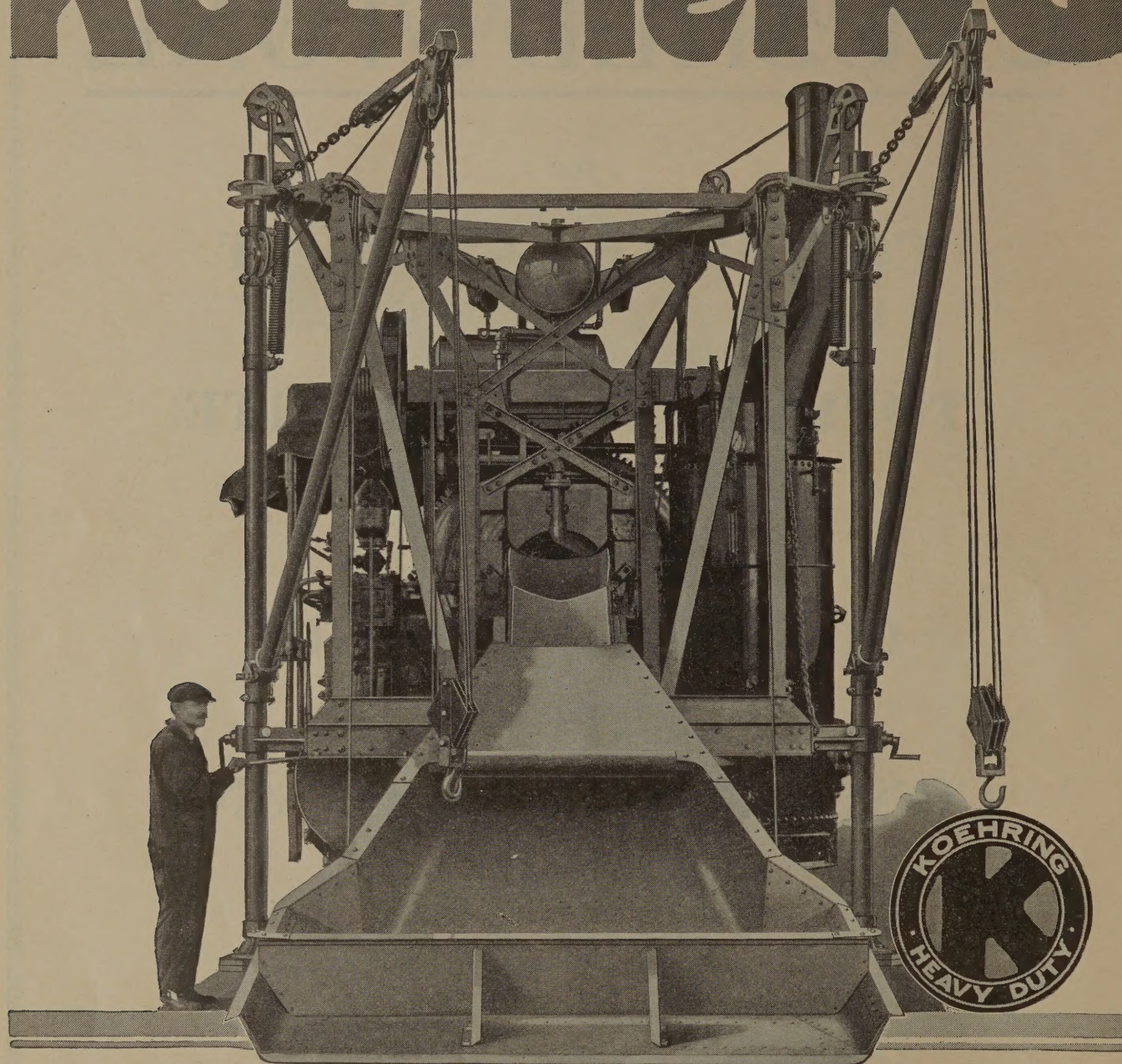
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ORINOCO SUPPLY CO.

WINSTON-SALEM, N. C.

KOEHRING



Loading End Strains

THINK of strains that the loaded fast-moving skip puts on the mixer frame! How they must tug and twist at the frame! Hundreds of times every working day. Thousands of times every season!

Now look at the Koehring frame construction—how the frame is braced, and re-inforced against strains and stresses from every direction. This is one reason why Koehring driving parts do not get out of alignment and set up unusual wear, breakages and delays. Get this Koehring "Heavy Duty" construction fixed in your mind, and recall it when you think about mixers.

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MADISON 6460 RICHMOND, VA. CHARLOTTE, N. C.
MADISON 1381 RALEIGH, N. C.

"Earnest Service by Earnest Bros."

KOEHRING CAPACITIES

Pavers: 7, 10, 14, 21, 32 cu. ft. capacities mixed concrete steam and gasoline. Write for catalog P-19.

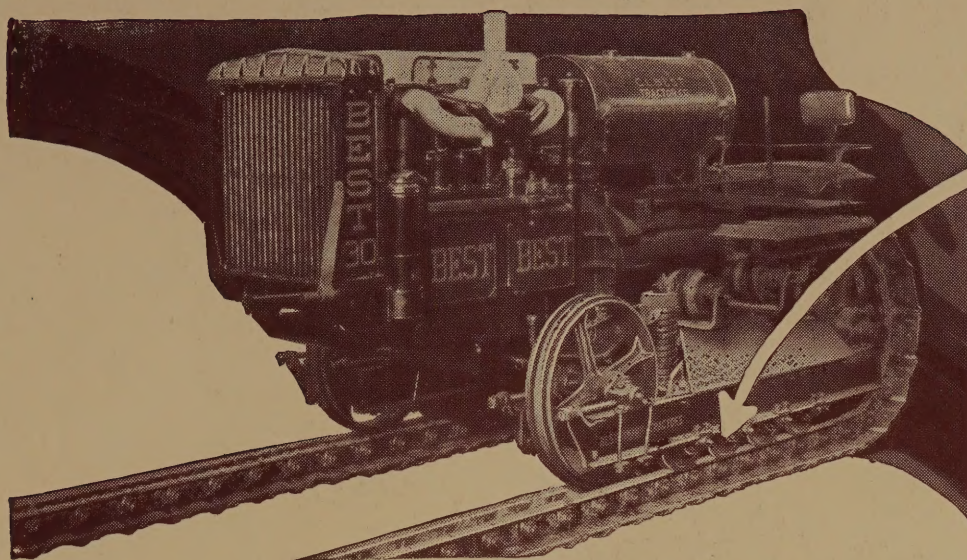
Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline. Write for catalog C-19.

Dandle: A light staunch mixer for footings, culverts, foundations, etc. 4 and 7 cu. ft. mixed concrete, steam and gasoline. Power charging skip, low charging platform batch hopper, light duty hoist. Write for catalog D-19. Rubber tires optional.

OTHER PRODUCTS:

Koehring Cranes and Shovels
Blaw Knox-Forms
Turntables
Bins and Batchers
Clamshell Buckets

C. H. & E. Pumps
PARSONS Excavators
JEFFERY Loaders



TRUCK ROLLERS *that* LAST!

THE DRIVING WHEELS of the most powerful locomotives have forged steel rims.

The Truck Rollers of a track type tractor support the weight of the tractor and the flanges of rollers must withstand severe jars and side strains of side hill work and rough going.

On Best Tractors the flanged rims of truck rollers are drop forgings—nothing less—forged into shape under heavy steam hammers, from heated steel of special analysis. After being forged the rims are annealed, bored and reamed, then turned true on the outside tread. They are next shrunk on accurately machined hubs—be-

ing hardened at the same time—hardened to resist battering blows just as are the heads of first-class forged hammers or sledges.

The rollers, complete, are mounted on anti-friction bearings to insure easy running, bearings with seals to retain lubricant and to prevent entrance of sand and ruinous grit.

The truck rollers of Best Tractors run over tracks which are true and straight. Tracks are made from drop forged hardened links which have been accurately machined top and bottom and large hardened spools and pins at each joint contribute to the long life which may be expected from the tracks on Best Tractors.

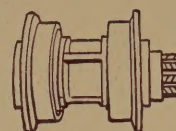
E. F. CRAVEN

"The Road Machinery Man"

GREENSBORO, N. C.

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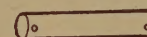
Truck Roller



Track Link Assembly



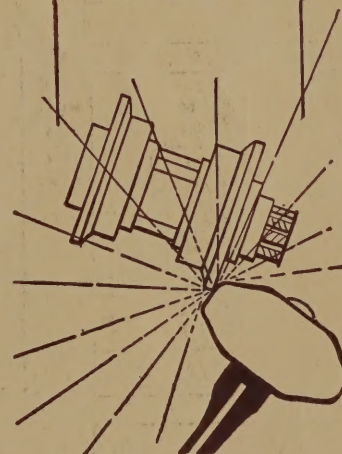
Track Spool



Track Pin



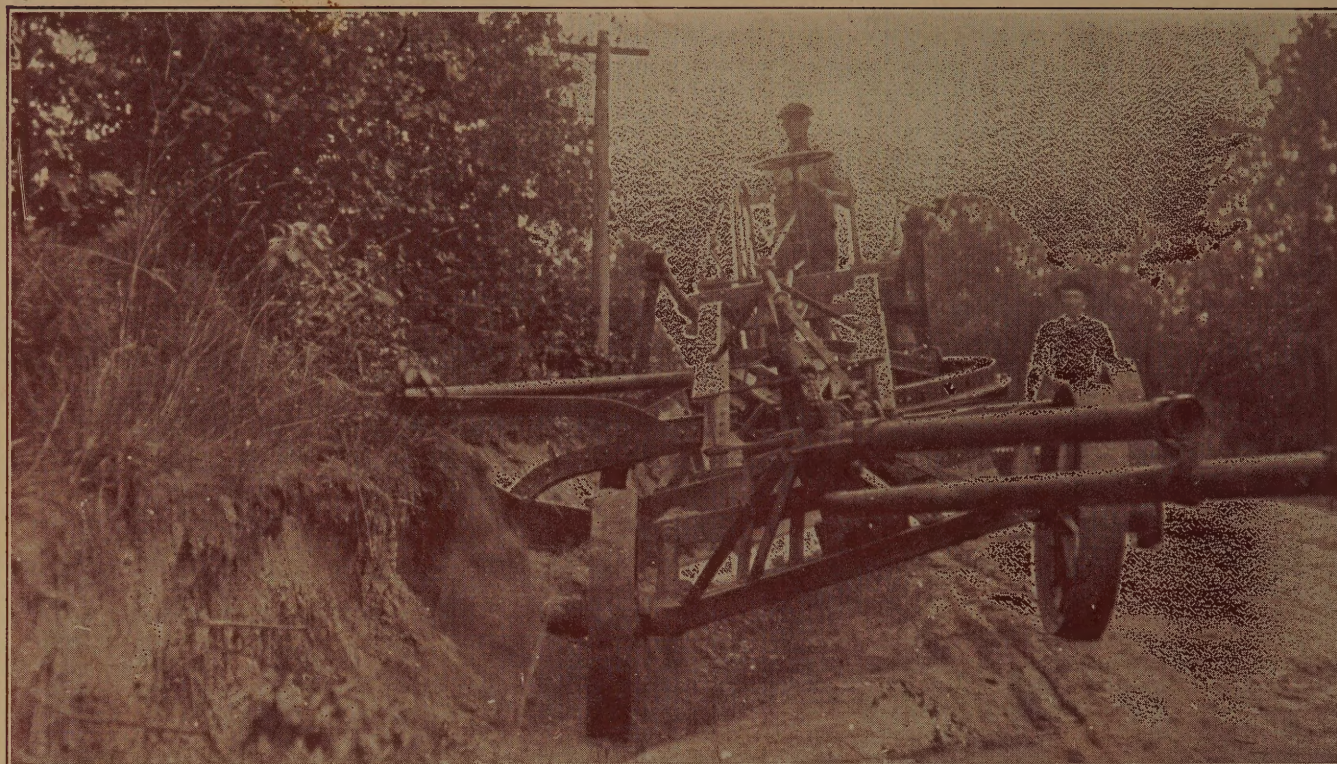
Heavy Cotter for Track Pin



"When Greek meets Greek." Both the sledge and the flanged roller rims are hardened drop forged steel.

BEST TRACTORS

1222-4



ONE OF THE NORTH CAROLINA STATE HIGHWAY DEPARTMENT'S NO. 12 ROAD KING CUTTING DOWN A ROUGH DITCH BANK

in North Carolina

HE LEANS TOWARD THE LOAD



SO DOES THE ADAMS
ADJUSTABLE LEANING WHEEL GRADER

ADAMS Graders have proved their superiority and their ability to build the most miles of Good Roads per dollar or per day. There's only one reason—the Adjustable Leaning wheels are an exclusive feature on Adams Graders by means of which the weight of Adams Graders is leaned toward and balanced against the load. This overcomes side-draft and skidding, increases capacity and lessens the draft. This feature also enables Adams Graders to do difficult ditch and bank work, not successfully accomplished with other graders.

Every Adams Grader is guaranteed to prove these claims. Write today for catalog and let us show you how Adams Graders will reduce your grading costs.

ADAMS GRADERS are built in 6½ ft. to 12 ft. blade lengths. There is a size to suit your needs and power exactly.

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